Comparision of a Modern U.S.S.R.

Kiering and Bleaching Process

With the Usual Western Methods

By A. J. HALL, B.Sc., F.I.C., F.T.I.

Following some reflections on the somewhat tedious and not altogether satisfactory methods at present being employed for the removal of natural and added impurities as found in grey cotton fabric the writer was fortunate enough to secure the translation of a very interesting report by N. V. Filopov and B. S. Voronkov (Investia Textilnov Promushlenosti i. Torgovli, 1930. Dealing with the development and large scale adaptation of an accelerated bleaching process in Russia for the 4th Government Cotton-Trust. The contents of this report are especially useful insofar as they indicate that the usual kiering and bleaching processes are capable of much improvement, and it is felt that the information given will be valuable to all connected with the wet processing of cotton goods.

AS is well known, the usual method for preparing cotton fabric for dyeing consists of singeing, steeping in the wet state with or without the presence of a starch liquefying enzyme for loosening and partial decomposition of starchy and nitrogenous impurities, boiling once or more (usually twice) with an alkaline liquor in a kier, followed by thorough washing, and bleaching with a liquor containing active chlorine in one form or other. The time taken for these processes is seldom less than 24 to 30 hours and may be even exceeded according to the period allowed for kier boiling. In contrast it may be at once stated that the Russian method occupies less than 2 hours and it is claimed that quite satisfactory results are thereby obtained. The question which naturally arises is—What is this rapid process?

In answering the above question it is first necessary to consider the nature of the impurities which require removal from grey cotton fabric and the degree to which the usual methods succeed in this. The U. S. A. Department of Agriculture have given the following data concerning the impurities in natural cotton fiber:

Water	6.47%
Ash	1.65
*Protein	1.50
Cellulose	83.71
Extract free from nitrogen	5.79
Fats and waxes	0.61

*Nitrogen content of the protein = 0.232%.

Since the warp yarn in grey fabric is usually sized with a size containing both starch and fats, the natural impurities must be increased to the extent of 3.2% of starch and 0.122% of fats (these figures are based on average data obtained by examination of large quantities of grey cotton fabric). All of these impurities are removed by the usual alkali boil in a kier followed by treatment with a bleach liquor containing active chlorine. In Fig. 1 is shown the extent to which the wax and fat and other impurities are removed by the different processes including and associated with kiering and bleaching, and it is evident that kiering is the most effective; the bleaching treatment is of course mainly for removal of the natural coloring matter in the cotton. In contrast with the above data showing the impurities in grey cotton material it is interesting to note those given below with regard to fully bleached cotton which is considered satisfactory:

	% Impurity present in cotton after:		
Impurity	*1st kier boil (Kollman)*	*2nd kier boil*	*Fulling kiering (U.S.S.R.)*
Fats and waxes	0.257	0.156	0.226—0.340
Nitrogen	—	—	0.008—0.015
Ash	0.104	0.060	0.100

Apparently in good bleaching practice it is necessary to remove practically the whole of the starchy impurities, 60 to 70% of the fats and waxes, and to lower the nitrogen content by about 95%; also 95% of the mineral impurities should be eliminated.

There is yet however another feature of bleached cotton fabric which is of importance, that is, its absorbent power. Grey fabric is difficult to wet out whereas correctly bleached cloth wets out immediately when placed in water. Cotton fabric may be quite satisfactorily bleached for dyeing purposes even when it contains small quantities of residual impurities provided that it is absorbent so that it wets out with a dye liquor rapidly and evenly. This absorbency can be measured by the rate at which water ascends a strip of the fabric when suspended vertically in water so that a portion of the fabric remains above the liquor. Under certain conditions it was found that a well bleached fabric is characterized by the following:

Time of immersion	*Height ascended*
1 minute	40 mm.
10	80
30	120

Present everyday kiering methods are considered by Filopov and Voronkov unsatisfactory mainly because of the considerable time required and the discontinuous nature of the operation. A continuous rapid method is desired. Following this thought it is evident that a kiering process is required in which the pressure boil becomes unnecessary; it then becomes possible to avoid the use of a closed kier and carry out the process continuously.

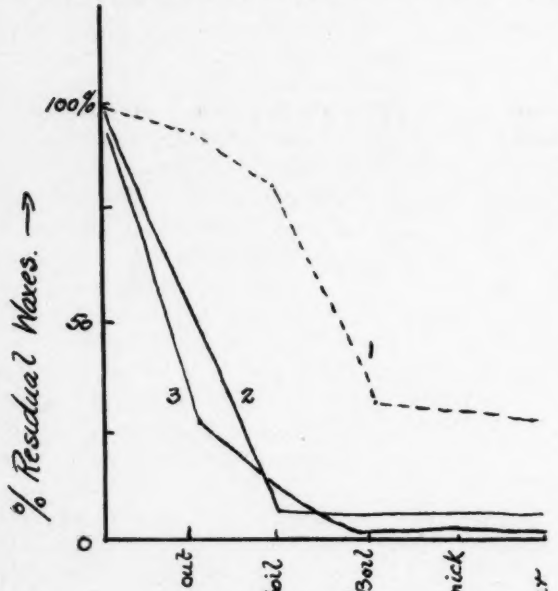

Fig. 1—Progressive removal of waxes, fats, nitrogenous and mineral impurities from grey fabric during bleaching.
Curve 1—Waxes and fats. Curve 2—Nitrogenous impurities. Curve 3—Mineral impurities.

The removal of the nitrogenous and starchy impurities appears to offer the least difficulty; it is the fats and waxes which resist removal. According to the researches of Knecht (J. Soc. Dyers and Co., 1911, *27*, 142) and Knecht and Streat (J. Soc. Dyers and Col., 1923, *39*, 73) and Fargher and Probert (J. Text. Inst., 1923, *14*, 49, and 1924, *15*, 337) cotton contains a very complex mixture of fatty acids and alcohols among which may be mentioned particularly montanyl and gossypyl alcohols. These substances appear to be so intimately distributed within the fibers that they resist extraction with aqueous and organic solvents so that for their complete removal prolonged digestion with such solvents as petroleum ether and chloroform is necessary.

In kiering it is believed that the removal of the fats and waxes is mainly effected by partial saponification of certain of the fats whereby sodium soaps are formed and that this is then followed by emulsification of the remaining fats and waxes. Kiering processes could thus be accelerated by improving the emulsifying action of the alkaline liquor employed, that is, by the addition of emulsifying agents.

P. P. Viktorov and Voronkov have found that on digesting cotton with a 6 Tw. solution of caustic soda under similar conditions but with and without the addition of 0.5% of the emulsifier "Epifasol," the fats and waxes left in the cotton were 0.06 and 0.29% respectively. Obviously the added emulsifier exerts a very valuable influence. As a matter of fact it is possible that several types of emulsifiers can be used and experiment alone is required to determine the one most efficient.

For various reasons, as will be seen later, Filopov and Voronkov selected as a suitable kiering liquor one containing caustic soda, sodium silicate, sodium bisulphite, and an emulsifier ("Contact"—a sulphonated petroleum residue) and in some interesting preliminary experiments they determined the effect of variations in the composition of this liquor and the time and temperature conditions during digestion on the absorbency of the resulting cotton fabric. In particular, samples of grey cotton fabric were heated in an open vessel at various temperatures for five minutes with the following liquor:—

Caustic soda .....20 parts per 1000
Sodium silicate of 39° Be.....15
Sodium bisulphite of 36° Be.....25
"Contact" .....5 to 30

and the capillarity of each afterwards determined; the results obtained are shown in Fig. 2. It is at once evident that the effect of the emulsifier is largely governed by the temperature at which the kier liquor is used; at low temperatures the effect is quite small and varies with the quantity of "Contact" present but towards boiling

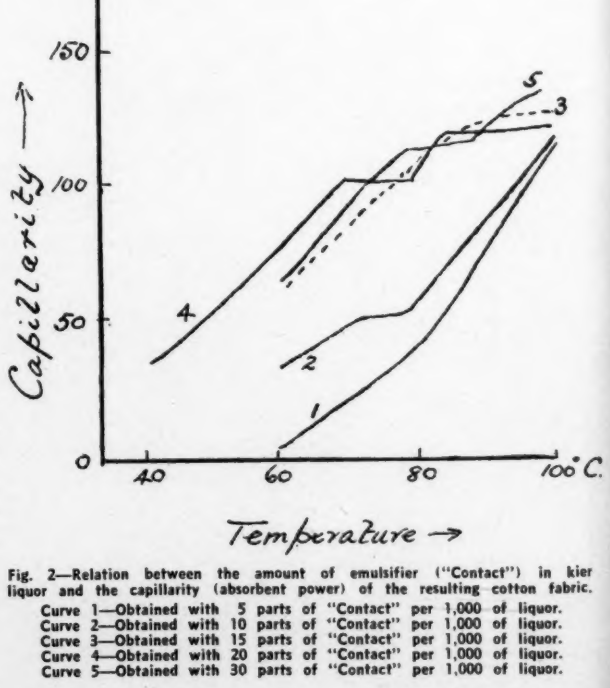

Fig. 2—Relation between the amount of emulsifier ("Contact") in kier liquor and the capillarity (absorbent power) of the resulting cotton fabric.
Curve 1—Obtained with 5 parts of "Contact" per 1,000 of liquor.
Curve 2—Obtained with 10 parts of "Contact" per 1,000 of liquor.
Curve 3—Obtained with 15 parts of "Contact" per 1,000 of liquor.
Curve 4—Obtained with 20 parts of "Contact" per 1,000 of liquor.
Curve 5—Obtained with 30 parts of "Contact" per 1,000 of liquor.

point the effect increases so that large quantities of this emulsifier are scarcely better than small amounts. As a matter of fact 20 parts of "Contact" per 1,000 parts of liquor appear to be very satisfactory, and in Fig. 3 is shown how the effect of this quantity is modified by the time and temperature conditions. The horizontal lines in Fig. 3 indicate the higher and lower limits of the capillarity of cotton fabrics bleached in the usual manner, and from this it may be concluded that treatment of grey cotton fabric with the liquor described above at 90° C. for 5 minutes purifies it sufficiently for practical purposes. At the same time it will be noticed that similar treatment at 40 to 50°C. for four hours does not yield such satisfactory purification.

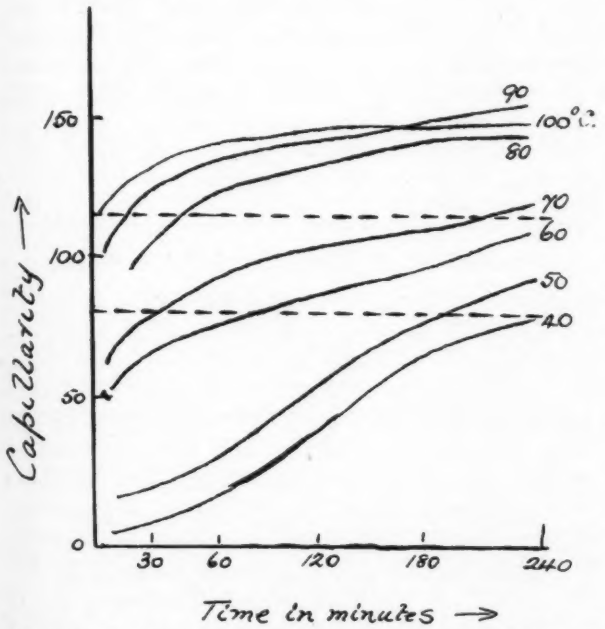

Fig. 3—Effect of time and temperature conditions on the efficiency of the alkaline boil in the presence of the emulsifier—"Contact."

A few further facts elucidated in these experiments are of interest as follows:—The additions of further 5.7 and 15 parts of sodium silicate per 1,000 parts of liquor results in increased capillarities of 15% and 19.5% respectively. If one-half of the caustic soda is replaced by soda ash considerably less fats and waxes are removed such that the ether extract of the treated fabric is increased by about 35%.

Filopov and Voronkov conclude that by using an alkaline liquor similar to that described above and containing a suitable quantity of an emulsifier (the particular emulsifier used is not very important) it is possible to remove the fats and waxes sufficiently from grey cotton fabric by a short treatment at a temperature not exceeding about 95° C. so that it has a capillarity which shows it to be quite suitable for dyeing or even for whites.

It is also necessary to consider the simultaneous removal of the other impurities present in grey cotton. Turning first to the proteins it will be remembered that about 95% of these should be eliminated in a satisfactory bleaching process, and as shown in Fig. 1, Hebden has found that usually 91.5% of these substances are removed in the first kier boil while scarcely any further amount is removed by the second boil. Knecht's observations are slightly different in so far as he found that 72.9% of the nitrogenous impurities are removed by the first boil and up to 93% by the second boil. Professor Chilikin has recorded the removal of 94.2% of nitrogenous impurities from cotton as the result of a full bleach. It is obvious that a certain proportion of the nitrogenous impurities are easily soluble since Fargher, Hart, and Probert (J. Text. Inst., 1927, *18*, 29) have found that when cotton is immersed in water at 60°C. for 12 hours some 37% of the impurities are removed. In contrast with these results it is therefore important to note that grey cotton fabric treated for 30 minutes at 90 to 95° C. with a solution containing per 1,000 parts:

Caustic soda	20 parts
Sodium silicate of 39° Be....	15 parts
Sodium bisulphite of 36° Be..	25 parts
Epifasol or Contact.....	20 parts

lost about 91% of its nitrogenous impurities; the remainder of such impurities were removed in the subsequent souring and washing processes so that the fabric finally contained only 0.01% of nitrogen and was thus equal in this respect to well bleached fabric.

Experiments have also shown that mineral and pectic impurities are removed equally satisfactorily.

Starch is the remaining impurity which is most generally found in grey fabric; it is introduced with the warp sizing and is present to the extent of 3.0-3.5%. As previously mentioned, about 70% of this is removed in the operations which precede kier boiling and which usually include a wet steep with or without the addition of a starch liquefying enzyme. Starch, however, is readily gelatinized by warm dilute caustic soda liquors and it would therefore be suspected that the alkali treatment described above would be sufficient to remove the small amount of starch present in grey fabric.

Filopov and Voronkov have ascertained that 2% is the most effective concentration of caustic soda for removing starch from fabric, but somewhat less may be used on a large scale since the mechanical handling of the fabric assists starch removal.

At this stage and with the necessary information to hand as outlined above, Filopov and Voronkov were able to devise the continuous process of bleaching which has proved successful on the large scale. Briefly, the whole kiering and bleaching system now so common is replaced by a process in which the fabric is heated for 30 to 40 minutes in open vessels at 85 to 95° C. in a liquor containing caustic soda (2.5%), an emulsifier (Contact, Epifasol, or any other suitable available product of this type, for instance, Nekal), sodium silicate, and sodium or potassium sulphite, and is then bleached in the ordi-

nary manner with a solution of bleaching powder of 0.2 to 0.5 Be. during a period of about 30 minutes, being then washed, soured in dilute sulphuric acid, washed and dried; all these operations are carried out continuously and the whole process occupies not more than 90 to 100 minutes. The alkaline liquor used consists of:—

Caustic soda 100%	10- 35 parts
"Contact T" or other emulsifier	5- 13 parts
Potassium sulphite of 38° Be	12 25 parts
Sodium silicate of 39° Be	7- 15 parts
Water	965-905 parts

The actual concentration of caustic soda employed is dependent on the conditions under which the fabric is treated, such as ratio of liquor to fabric, and the extent to which the liquor is renewed, but in general a 2% solution is satisfactory.

The whole of the bleaching plant comprised the following:

1. Group of "Matesius" boxes in which the fabric is continuously treated for 35 to 40 minutes with the caustic alkaline liquor.
2. A heavy squeezer to remove the alkaline liquor.
3. Two "Clapeau" washing machines using warm water.
4. Two ordinary washing machines using cold water.
5. Group of "Matesius" boxes in which the fabric is continuously treated with bleaching liquor during 25 to 30 minutes.
6. Two "Clapeau" washing machines using cold water.
7. Two souring machines.
8. Two washing machines for giving a final thorough wash.

With such a plant it was found possible to run two ends of fabric simultaneously and thereby process 400 pieces per hour, and in order to test out the process thoroughly a trial bleach was carried out. First the plant was used for bleaching about 16,000 pieces of fabric so that all the liquors were initially charged with removed impurities. Then the trial lot of fabric was processed and afterwards carefully tested with the following results:

Impurity	*% in Bleached Fabric*
Fats and waxes	0.188-0.196
Nitrogen	0.010-0.121
Ash	0.09 -0.11
Capillarity, 1 min	41-51 mm.
Capillarity, 10 mins	111-117
Capillarity, 30 mins	147-155
Degree of whiteness	81.9-83.3%

These results are quoted as indicating that the bleaching is satisfactory. It is further noted that it is occasionally necessary to run off the caustic and bleach liquors and replace with completely fresh liquors so that all impurities are discharged from the system. This, however, need no be very frequent, it being found that it is possible to process 50,000 to 60,000 pieces before this renewal becomes necessary.

Filopov and Voronkov state that in 1929—1930 a complete plant based on the above system was erected and with it a daily output of 5,000 pieces was satisfactorily secured—the working day consisted of two 8-hour shifts.

Igepon T Powder

The General Dyestuff Corporation announces Igepon T in a powder form. Igepon T Powder is the same as the paste brand in effective strength and general properties. Igepon T Powder is a detergent which is said to be stable to hard water, acids and alkalies met within textile processing.

A circular describes the use of Igepon T Powder for kier boiling of cotton, bleaching, dyeing of cotton and rayon, its application with Indanthrenes and Naphthols, and in the finishing of textiles. It also deals with the advantages of Igepon T Powder in an acid bath on wool, and acid milling.

It is claimed that Igepon T is of value for the removal of alum soap from shower proof material.

Freshening and Cleansing of Velvet Goods

S. S. Ztg.—Deutscher Faerber-Ztg. 68, 74 (1932).—Owing to the characteristic luster of velvet, which depends upon its structure, its treatment requires special care. Common kinds, of cotton and linen, are more easily handled than the better grades. In many cases, only a simple brushing off lightly with cold water is needed to freshen up a piece of goods, the brushing being best done with a downward stroke along the "grain" of the goods. A small amount of acetic acid or vinegar in the water often imparts a fresher aspect to the goods. Simple hanging up to dry is all that is then needed—no pressing, of course.

If the velvet is lightly spotted here and there, the liquid used for the brushing may consist of 2 volumes of alcohol and 1 volume of distilled water. The brush is dipped into this liquid, then held over the spotted area, and the bristles rubbed with the fingers so as to spray the liquid upon the goods. Then a dry brush is lightly passed over the goods, downward, along the run of the goods, and the spots will usually disappear.

With high-grade wool and silk velvets, only this method should be used, to avoid flattening out of the pile; coarser wool and cotton-wool velvets must be sufficiently moistened in the way described, in order to get any spots removed. If this treatment still leaves any spots, the goods must be rinsed in distilled water and hung upon a form to dry. A slight centrifuging previously will perhaps help. When dry, the goods are moist-steamed, and brushed gently along the grain. Too vigorous brushing must be avoided, as the pile is thereby pressed down, and in the dry condition thereafter the markings will be difficult to remove.

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STANDARD SILK SAMPLES

There have been prepared, under the direction of the Sub-Committee on Fastness of Dyed Silk, standard dyed silk fabrics to represent four classes of fastness to washing—namely, Class I, Class II, Class III and Class IV. These standards have been carefully dyed with the dyestuffs and according to the dyeing methods recommended in the 1931 Year Book.

The A. A. T. C. C. is prepared to furnish sets of these washing standards for a nominal charge which will cover the cost of preparation. It will be possible to accurately grade the fastness by comparing it with the standards after subjection to the standard washing tests approved by this Association. All inquiries concerning these Silk Washing Standards may be addressed to the Chairman of the Research Committee.

Louis A. Olney,
Lowell Textile Institute,
Lowell, Massachusetts.

Analytical Methods for a Textile Laboratory

The Council of the A.A.T.C.C. believing that Dr. Scott's series of articles entitled "Analytical Methods for a Textile Laboratory" might well be brought together in book form, have proceeded with its publication. The book contains 80 pages, and is of handy size for use in the laboratory. They may be obtained from the Secretary of the Association for 75 cents.

SATURDAY MORNING SESSION
Annual Meeting December 3, 1932

The meeting convened at ten-thirty o'clock, P. J. Wood, President of the Association, presiding.

President Wood: Gentlemen, the presidential address having been made at the opening of the meeting at nine-thirty (there was nobody here at that time) it is unnecessary for me to go over that. (Laughter and applause)

The first paper on the program will not be read. Mr. Clark found it impossible to be here.

[Ed. Note. Mr. Clark's paper will be published at a later date.]

I will call on Mr. A. D. Robison of the Union Bleachery to present the first paper of the morning session, "Normal Costs a Necessity, Simplified Method to Correct Plant Inefficiency." (Applause)

Normal Costs a Necessity

Simplified Method to Correct Plant Inefficiency*

By **A. D. ROBISON**
Union Bleachery

THIS article is not an attempt to tell you how to operate your cost systems, but is an effort to try to convert you to normal cost methods. In these days of close margins and keen competition you cannot afford to be ignorant of facts as vital as those concerning your cost of doing business.

There are many plants today still using the old antiquated actual costs, which do not reflect a true cost for selling purposes for the reason that the cost accountant or executive usually bases his selling price on monthly or quarterly periods at peak production. This is not general, however, but it is quite evident that this procedure is still being followed in many plants from the quotations submitted by some finishers. Such a marked variation in prices is not due to differences in cost of labor and materials. The only variable factor would be their consideration of overhead expense. This item of expense does not vary with production because of the presence of many fixed charges. To charge the total overhead actually incurred, even if it could be accurately prorated to the product for the month in which it is incurred, would therefore unduly burden production costs in slack periods and understate them in active seasons. Overhead should be considered as a function covering a complete business cycle and not be absorbed in production by method known as actual costs.

Just in passing I would like to call your attention to a comparison of costs and finishing price now prevailing in the industry. I understand that certain finishers are now quoting a price of .65 points per yard for finishing an 80/60 plain backfilled white broadcloth. I have computed costs for several southern finishing plants, which are well managed, and the lowest possible average normal cost of this finish is .86 points per yard. An analysis of this figure reveals the following:

	POINTS
Direct labor	.14
Department supervision and indirect labor	.08
Variable overhead expense	.14
Direct drugs	.19
Constant overhead	.31
Total cost	.86

This results in a direct cost of .55 points per yard. That is the finisher is actually disbursing .55 of the .65 points revenue to directly finish this particular fabric, not considering the administrative overhead burden.

The purpose of business is service, but it cannot exist or continue without profit. It is an acknowledged fact that there should be a profit between selling price and cost, yet frequently this basic fact is overlooked when selling prices are cut to meet a competitor or to keep the plant running, which is perhaps good enough in itself but which may be in error through the fact that it does not take into consideration the cost.

It is a fallacy to presume that a finisher can fix his selling price based on cost. But if necessary to compete on basis of market, he should do so on exact knowledge as to whether or not his prices are above or below costs, as he should always consider that the day of reckoning lies before him.

Even if the selling price is beyond his control, most certainly his cost should be within his control. If the demand has established a price less, for example, than the cost of the product, he has the advantage of discontinuing the line rather than waste all of his assets. In ordinary cases the finisher can control his costs to a large

*Presented at Saturday morning session, Annual Meeting, Dec. 3, 1932.

extent, but he can only do so if he knows all of the factors entering into the same.

Several years ago I knew an executive who would frequently request estimated costs on special finishes to be processed and would instruct his cost accountant to base them on the best production periods available. This of course resulted in loss of profit on these fabrics because his consideration of overhead expense was understated as he did not absorb the idle expense in the slack season in which the fabrics were processed. If this executive and many others in the industry had adopted normal costs, they would not be facing the terrible condition they are now confronted with.

It is therefore vitally necessary that we adopt normal cost methods for selling purposes.

I will pause at this time to give you a brief outline of a simple method to follow in adopting normal costs methods. Expense would be distributed in the usual way, isolating the same into constant and variable overhead. Ascertain from past records of at least two years the operating percentage of each process, making adjustments to cover any change in conditions. This percentage would be used for increasing or decreasing your operating hours for the period. These adjusted hours would be the basis for your constant rate per hour. The actual hours operated would represent the unit for the variable rate. The total of the two rates would result in a normal cost per hour. The above method is simple to operate and has many advantages too numerous to mention.

In these times of distress, during which a period of readjustment is necessary and in some cases beyond our control, we should consider every possible method to alleviate expense. A good illustration of this fact is shown in the following comparison: A 64/60 backfilled muslin was finished for approximately three-quarters of a cent per yard in 1915 against a labor cost of $1.25 per day. The identical finish today is priced at 7/8 cents per yard while the labor cost is $3.30 per day. This shows an increase of 264% on labor compared with an increase of 17% in finishing price. From these figures it takes no clairvoyant to see the necessity of increased efficiency.

Every industry is doing everything possible at present to try to correct the economic situation, and it is an acknowledged fact that unfair wage slash tends to prolong this crisis rather than bring about speedy recovery. It is therefore necessary, both from a selfish and a humanitarian standpoint, for industries to seek some other method for reducing plant expenses.

We have at the Union Bleachery obtained very satisfactory results from a simple competition among the machine operatives in each department. This wage incentive does not entail any great expense and the results are most satisfactory. I believe this method is worth your consideration and will briefly outline the same.

We first analyzed from past records the efficiency of each machine in each department and adopted a standard on the basis of the best averages, making adjustments for stops for roll changes, etc., to make each machine's production comparable. The most efficient operator for the department receives $2.50 extra, the next efficient $1.50 and next $1.00, making a total of $5.00 per department.

We have also given the departmental supervisor an incentive to increase efficiency by setting up an average total percentage standard for his entire department. He is graded on the following basis: The 100% efficiency of each machine is first determined and adopted as standard, making no allowance for interruptions. The hours operated are accumulated each week and total multiplied by the 100% standard. The operating standard is then obtained by adding the result of the hours multiplied by the 100% standard on each machine. The total actual production for the department is then divided by the total standard to obtain the actual per cent of operation. We will assume that the Calender Department operates on the basis of 80% efficiency. If this efficiency is obtained, they receive an award of $3.75. Should this department operate 84%, they receive $6.25. As the department operations attain more nearly perfect operation the award is increased accordingly.

We also give additional incentives for reduction in the per cent of returns, reruns and narrows.

While the above methods are very simple, nevertheless the results indicate a saving of approximately $45,000.00 per year in labor.

This article has been written solely for the purpose of trying to point out the benefits to be derived from a normal cost system and with a wholehearted desire to see uniform costs inaugurated throughout the textile industry.

I trust that this article has brought to your attention the absolute need of a modern cost system.

Discussion

After Mr. Robison presented his prepared paper, he made the following extemporaneous remarks at its conclusion:

Mr. Robison: I should like to further that by saying that you probably think that method of keeping normal costs doesn't apply in the dyeing industry. It does. It applies throughout the whole cotton industry. It can be applied at cotton mills, bleacheries, by dyers, printers, etc.

I thank you. (Applause)

President Wood: Are there any questions you would like to ask Mr. Robison?

Mr. C. L. Eddy: Mr. Chairman, I should like to ask the reader of the paper if in figuring his bonus for foremen he included the amount of the returns charged against that department. Did that in any way affect the amount of bonus received?

Mr. Robison: We have that tied in. I didn't especially emphasize that because we haven't, I am sorry to say, obtained good results from that phase of it, but the foreman is penalized, that is, he still gets his $3.75 as I first mentioned but if his returns are not over a certain percentage he gets $5.00. Therefore, he gets a bonus for not getting those returns. Those returns are based on the total for the entire plant and not on individual departments because we found that that would cause too much friction and it would be difficult to determine just how much of the returns were chargeable to any one department.

President Wood: Are there any further questions you wish to ask Mr. Robison? It seems to me he has given us a great deal of food for thought.

Of course, the idea of a bonus is not new and it has been tried but generally in more prosperous times. What we are faced with at the present time is trying to get the costs down to the selling price (laughter) and I think that is a very vital problem with everybody in industry today, not only in the textile industry but in all industries.

It seems to me that it might be a good deal easier in the dyeing industry than it is in the printing because a complication enters there in the degree of difficulty of, say, the registration of a pattern, the perfection of the rollers on new patterns, (they frequently have to go back) the numerous interruptions that occur, the establishment of new shades and things of that sort which would add to the difficulties of applying this system in printing.

Have you had any experience in other works or heard of any experiences in other works with regard to putting this system in the printing industry, Mr. Robison?

Mr. Robison: No, I haven't had any direct experience with the printing industry but I know something of the conditions in that industry and with what they are confronted. Of course, we have different methods for different departments. All those are detailed items I didn't go into.

I should just like to call attention to that matter of bringing costs down to selling prices. That is one thing I just pointed out. It seems that some finisher in the industry comes along—it might be a little fellow—and he reduces his costs. He thinks he is getting by. For the comparison I would call that 65 points per yard. He is fooling himself because he probably did that on an actual cost basis at some period in the year when he did run at peak production, probably for ninety days, and he figures that he will probably come out and make an even break with 65 points. That isn't true. He can't do it. And that is the thing I was trying to point out and put over, the fact that these fellows are not using the normal basis for computation of costs.

President Wood: Are there any further questions anyone would like to ask Mr. Robison before I call on the next speaker?

The next speaker is Dr. William Stericker, of the Philadelphia Quartz Co., who will present, "The Use of Silicate in the Textile Industry." (Applause)

The Use of Silicates in the Textile Industry*

By **WILLIAM STERICKER**
Philadelphia Quartz Co.

IN GIVING this title to Dr. Powers over the telephone I evidently didn't speak very clearly because he failed in one very important point. He said, "Silicate" instead of "Silicates," and just to show you that there is a difference I am going to show you some different silicates and the properties that they have in order that you may have an idea that I am not just trying to complicate the problem.

We make a series of products, all of them silicates of soda, some of them very heavy, some of them very sticky, so sticky that I don't even like to hold them in my hand.

Some of you may have seen this (showing bottle) before. That is a silicate which pulls something like molasses taffy when you get it started, containing 67½ per cent solids.

I have another one here which looks perhaps a little more solid. It contains the reverse proportions, that is, 32½ per cent solids. This one is quite different in its properties. It bounces like a golf ball but it breaks very easily.

In between those we have some other products and some of you may recognize this product (indicating)—I hope you do. That is Star Brand.

If we drop some of this bouncing ball stuff in there—

*Presented at Saturday morning session, Annual Meeting, Dec. 3, 1932.

perhaps I had better put the other one in first—if we drop some of this sticky stuff in there, it is heavy and it goes to the bottom. Now if we take this apparently solid material and drop it in there, I think it will float. I always have to say, "I think," because you never can be sure that something might not happen. (Laughter)

If we took this thick, sticky stuff and diluted it to the same water content as the bouncing ball, it would be a very thin fluid, something like the one in the jar, but with more alkali in it. The sticky material has 14½ per cent Na_2O in it. The other one has 7 per cent Na_2O in it, and the difference is in the silicate.

The "B" brand, which is the sticky one, has only a little over one and a half times as much silica as alkali. The over-concentrated "S" brand has nearly four times as much silica as alkali. The Star is intermediate.

Those are all colloidal solutions, that is, there is colloidal material in there. They show a good deal of diffusion of light under the ultramicroscope.

Then recently we have produced another product which we call "Metso," sodium metasilicate with five molecules of water. This is produced in granular form or as crystalized material.

These again have different properties and there is more alkali in proportion to silica in these crystals than in the sticky "B" brand that I showed you.

Now, you say, "What relation does this have to the textile industry?" It means that you have here a series of products which are capable of showing different pH values with the same total alkali, or, to some extent, the possibility of having different total alkalies at the same pH value. Since the silicates act as buffers, it is much harder to do the second, and the silica is the material which buffers the silicates.

With a series of materials like that it is natural that we should have a variety of uses not only in the textile industry but in all industries, and in the past two weeks I have been out on adhesive uses and uses in the manufacture of grinding wheels. We sell silicates for so many purposes that I sometimes think I am a jack of all trades and don't know anything much about any of them. I certainly wouldn't attempt to pose as an expert on textiles.

Now then, I showed you this clear material, Star Brand. The ordinary commercial silicates as first made are somewhat cloudy and contain some impurities. They are small, not very great, but we believe for textile purposes it is desirable to have a clear silicate from which at least part of these impurities have been removed and we have two in particular which we believe are desirable for the textile trade—Star Brand and "E" Brand. "E" Brand is less alkaline than Star.

You know as well as I do that some impurities in the silicate are not dangerous. Others of them are. I don't suppose magnesium does any harm. At least, if you give a bleaching bath a dose of Epsom salts it helps rather than harms, I believe. Iron on the other hand is a dangerous material. We have figures showing that the danger from iron is much less in the presence of silicate, but it is still likely to cause trouble in textile processes, not only in bleaching but in dyeing and other places where there is a possibility of settling, especially where it is in the form of flock, and causing local spotting. I have seen cases where, in bleaching, flock containing high amounts of iron has caused actual burning of the goods in spots. That was not on cotton. That was on silk.

The iron which is actually in some sort of solution, probably colloidal, is much less dangerous than that present as flock or as iron rust, and more recent results would indicate that very small amounts of iron do not catalyze the decomposition of hydrogen peroxide. I am not sure about that. That is an extension of a curve, and I am not sure, even though the rest of it is a straight line, that it doesn't curve off as it gets toward the very small amounts.

That brings up one use, and a rather old use, that silicate has been put to in the cotton industry—in boiling off cotton, in the days when bleaching and boiling off were not done at the same time, they used to add some silicate to the caustic to prevent kier staining.

Another property that these silicates have, due to their colloidal properties, is that of preventing the deposition of dirt or of other materials on the fabric. We have done a great deal of work in laundering on that, and it also works in the kier. That is, it prevents the redeposition of material which has been taken off. In some materials we find that if you put a clean and a dirty piece of cloth together you get the clean piece coming out dirtier than it went in, even though it is in a washing solution.

Kiers have been lined with silicate by painting it on and then dusting on Portland Cement. These are washed out well and a coating furnished which prevents the iron kiers from causing trouble.

Silicate has been widely used in peroxide bleaching. It is also valuable in chlorine bleaching. In chlorine bleaching we use these more alkaline materials, a more dilute solution of this sticky material, or solutions of the Metso. The Star Brand or even less alkaline silicates seem to be preferable for peroxide. In hypochlorite bleaching and chlorine bleaching, the silicate does not prevent loss of oxygen from the straight bath as it does with peroxide but it does slow the release of oxygen when bleachable material is present. It has been found that the colors obtained are better, using the same amounts of material, and that the strength of the goods is greater.

In peroxide bleaching, silicate has an advantage in protecting against spots of other metals. Copper is one of the worst catalysts for that purpose and the presence of silicate very markedly reduces the evolution of oxygen, dropping it in some cases for from comparative volumes of six to seven down to a quarter.

Ammonia used to be used as an alkali for peroxide bleaching. I think that has largely disappeared except on some wool bleaching, but on silk and cotton, I think the fact that silicate does stabilize the peroxide baths when they are not in use is a very great feature.

In peroxide bleaching of silk and wool where the bath is used time and time again, building up between times by the addition of peroxide and silicate, the impurities increase rapidly. There it becomes very important to use a clarified silicate from which part of the impurities have been removed, in order to prevent them building up, and one bleaching expert has told me that it is absolutely impossible to use commercial silicate for any great number of bleaches in a standing bath. Some of the Star Brand baths ran six and eight months on wool, which was astounding to me.

There are a great many other uses for silicate in the textile industry. I just have time to mention a few of these.

It is used in boiling off rayon, in connection of course with other materials. It has been used for setting dyes on textiles, in leveling dyes on textiles. Then recently we have done some work in which mixtures of silicate with materials which render it more flexible have been used in coatings. We have some interesting results in that respect but they are still laboratory results. As far as I know, nobody has done this on a plant scale. Silicate alone when it dries is inflexible, cracks off, and is very unsatisfactory for that particular purpose, but by adding other materials as a softening agent, we are able to get a coating.

Thank you. (Applause)

Discussion

President Wood: Are there any questions anyone would like to ask Dr. Stericker?

Mr. Arthur Thompson: Mr. Chairman, I was interested in Dr. Stericker's remarks regarding the effect of silicate on the strength of fabrics bleached where silicate has been used in the kier, or bleaching solution—I didn't get which.

Dr. Stericker: In the bleaching solution, hypochlorite solutions especially.

Mr. Thompson: I was very much interested in that. Can you explain in a little more detail how that was brought about?

Dr. Stericker: You mean the mechanism of it?

Mr. Thompson: What have you done to indicate that and how have your conclusions been drawn?

Dr. Stericker: Our conclusions were arrived at by running the same bleaching solution with and without silicate and taking the strength of the fabric afterwards. I think I can give you some figures on that.

Mr. Thompson: The same fabric?

Dr. Stericker: The same fabric, cut out of the same piece. These were laboratory results again where we could control conditions but I believe there have been some plant experiments which have indicated this same thing.

Mr. Thompson: What I am interested in knowing is, do you attribute that increase in strength to a deposition of silicate in the fiber or a buffering action of the—

Dr. Stericker: It apparently is a buffering action, and particularly in preventing the formation of oxy- or hydro-cellulose, the copper numbers were much better.

Mr. Thompson: When silicate was used?

Dr. Stericker: When silicate was used.

Incidentally, in that same series we did try to find out how much silica was deposited and the amounts were very, very small indeed, and we even went to the extent of washing in very dilute hydrofluoric acid to remove the silica and found that the strength still stood up in spite of the additional acid treatment.

Mr. Thompson: Would it be possible or practical to try to leave some silica in the fiber, as a means of increasing its weight as well as its strength?

Dr. Stericker: It would be possible, I believe. In that case you would probably have to use a souring process in order to deposit the silica, and keep it there.

Mr. Thompson: It would be deposited as silicic acid I presume.

Dr. Stericker: Yes.

Mr. Thompson: Wouldn't that flake out on you?

Dr. Stericker: Yes, the big trouble is to keep the silicic acid there. The amount that is there is small, to start with, and unless you use some special process with a considerable amount of silicate still in the fabric—and then you would have to do something to render it insoluble—it will wash out in the washing process.

Mr. Thompson: Which silicate would you recommend for that purpose, the one with the high alkalinity or the one with the low alkalinity?

Dr. Stericker: The one with the low alkalinity.

Mr. Eddy: I should like to ask the Doctor a question in relation to peroxide, silicate for peroxide bleaching. Why do you recommend Star Brand? Why not use the cheaper silicate, and what would happen if you did?

Dr. Stericker: Well, I tried to cover that slightly.

We have recommended Star Brand because it is free of flocculent material which will be deposited on the cloth in some amount. I will admit that the amounts are small but there are some materials there. We have knowledge of some cases where there were failures with peroxide bleaching until they used Star Brand. They tried commercial silicate and were not able to work it, and then we went in with Star Brand and we were able to do it.

That has been our main reason for recommending it. In some cases we have felt that "E" Brand was preferable on account of the lower alkali content but in cotton bleaching we believe that the higher alkali content is an advantage.

Of course, there are acidic materials formed during the bleaching by the oxidation of the organic material and we believe that the additional alkali there is desirable.

On wool, Star Brand has been used to a considerable extent but there my own inclination would be to recommend "E" Brand.

I might say that on wool you do get this deposition of silica which you do not get on cotton.

Mr. Manning: Where does the hydrocellulose come from in peroxide bleaching? I can understand where oxycellulose comes from but not hydrocellulose. You say it acts as a retarding agent in the formation of—

Dr. Stericker: That was in the chlorine bleaching.

Mr. Manning: I thought you were talking about peroxide bleaching.

Mr. Harold Schroeder: Is it possible to raise the temperature of the chlorine in the presence of silicate? Is it still a strengthening agent?

Dr. Stericker: I don't remember for sure whether we tried that or not. I don't think we did.

Mr. Schroeder: Did you boil any?

Dr. Stericker: I don't think we actually did boil it.

Mr. Archibald K. Sefton: We have had some difficulty with the deterioration of silicates due of course to our mechanical department holding onto the material and probably keeping it exposed to air. Is there any test whereby we can tell whether we should use fresh silicate and throw the old away? That is what I want to know: is there any rapid test that we can use to tell our mechanical department whether they should change to new silica?

Dr. Stericker: Well, with a clear silicate you do have some indication in that it tends to cloud slightly and you usually can tell that in that way. If the drum is kept perfectly tight, I would say that it was probably safe to use old silicate. On the other hand, I have been in a silk mill where the drums were stored outside and the bungs left off.

Mr. Sefton: I think that is what happened. We use it in connection with Portland Cement. We use your "N" Brand, and no doubt the trouble was due to careless handling, but I was wondering if there was any test whereby we could tell the mechanical department to change to fresh silicate, or insist that they change to fresh silicate.

Dr. Stericker: We usually determine the carbon dioxide in an effort to find that out, and we also watch the change in viscosity. "N" Brand happens to be a grade in which the viscosity is high enough so that exposure will change it considerably. With Star that would not be true. There the appearance of the material would be a better indication.

Mr. McMahon: I have been using silica soda for the last twenty or twenty-five years. My reason for using it was to precipitate the iron that might be in the water. The other reason was to give a coating to the kiers.

Since going on dye work I have been advised that putting silicate in the boil has the effect of retarding or hurting the dyeing process. I should like to know about that. And according to what you say, you strengthen the fiber by the use of silicate not because you are putting a strengthening coating on there, but really I believe what I have been advised is right—the fact that you are putting a coating on there would retard the dyeing.

Dr. Stericker: That is what I wanted to bring out in my answer to Mr. Thompson, that is, that this coating is very unstable and washes off very readily. Are you washing after your process, before it is dyed?

Mr. McMahon: Absolutely, yes.

Dr. Stericker: In that case, all our tests have shown that that very tenuous film of silica that is deposited is removed. Of course, there are possibilities, if the silica remains in there, of preventing the taking up of the dye, but I would say in the normal process that that silica was all removed, and we tried to show the strength by removing the silica entirely with hydrofluoric acid—even the silica that was originally there was ash in the material and we still got the increase in strength.

Mr. McMahon: Well, if you have the increase in strength there must be a silicate still in the fiber.

Dr. Stericker: Well, in that case it was prevention of the action of the chlorine in dissipating the original strength of the fiber.

Mr. McMahon: Well, then, are you prepared to say that the using of silicate does not in any way affect the dyeing process?

Dr. Stericker: I would hardly say that because if you get less of the more readily dyed, changed cellulose, naturally, it won't. That is one of the tests we use for determining that change in the cellulose—how readily it takes up the dye, the Methylene Blue test.

Mr. Harold P. Goller: Dr. Stericker, I have been trying to follow this thing through. Do you show strength over the grey goods?

Dr. Stericker: No.

Mr. Goller: Do you lose less strength?

Dr. Stericker: You lose less strength.

Mr. Goller: It seems to me that question was not quite clear.

Dr. Stericker: I see. I am sorry I didn't make it clear.

Mr. Goller: It may be my fault. I may not have been following closely.

Dr. Stericker: It is not an increase over the grey goods—you are quite correct there. It is an increase over the ordinary bleached goods, as compared with the silicate bleach.

Mr. N. R. Vieira: In regard to Mr. McMahon's question, I think what he was referring to was the so-called silicate resist in flock kier boiling. I think what he was

looking for was an answer to the problem of removing those things.

Dr. Stericker: Well, if that silicate resist is in the form of flock, it is likely to be the sort of thing that I was talking about when I tried to answer Mr. Eddy's question. That is, if this insoluble flock—usually a calcium or magnesium silicate—settles on the fiber then you are sure to get these silica resists that will not take up dye properly and you will get spots in your finished goods.

Mr. Vieira: How can you remove that, practically?

Dr. Stericker: Practically? I should say that you would have to use Star and then probably give an alkaline treatment afterwards. It is better to prevent it, if you can.

Mr. Thompson: What is the nature of the cloudiness of some brands of silicate, and what harm does that do?

Dr. Stericker: The material we get out, on removing that, consists of alumina, silica, calcium, magnesium, titanium, and iron. We removed quite appreciable amounts of titanium even when the silicate did not give a test by any ordinary colorimetric method—we found as much as three per cent in the flock which came down. It is largely silica—eighty per cent of it is silica.

Mr. Thompson: What, not in solution?

Dr. Stericker: Not in solution,

Mr. Thompson: That is not desirable?

Dr. Stericker: That is not desirable. It gives this same sort of thing. It is probably in combination with calcium and magnesium in the form of very fine, insoluble silicates.

Mr. Ralph Hart: What is the pH range of your Star silicate—the different concentrations, approximately?

Dr. Stericker: I will give you some exact figures on that in just a moment.

Well, in concentration ranging from two-tenths of a per cent of silicate up to six and a half per cent of silicate, the range is from 10.7 to 11.4.

President Wood: What is the maximum amount of silicate which can be used in weighting silk intended for printing in order to avoid tendering?

Dr. Stericker: Perhaps I had better say I didn't realize that you were interested in silk so much.

The weighting of silk depends on three processes, that is, silicate weighting of silk. The silk is first put into a bath of tin crystals. It picks up tin. Then it is washed and put into a bath of disodium phosphate. That process is repeated several times depending on the weight that you want to get. The silicate is the final process and the amount of silicate taken up depends upon the amount of tin and phosphate previously put on there, but there is only one silicate bath in any case.

Some of the printing establishments are weighting to 24 ounces. I have seen printed goods that I know were weighted to 26 ounces, and I have suspicions that some of them have weighted to 32 ounces before they printed. That requires an entirely different type of dye, in order to get good results. Instead of putting it on the silk, you are putting it on the weighting.

President Wood: Well, what would you say was the maximum amount of silicate that could be deposited on silk without danger of tendering?

Dr. Stericker: Under good conditions, probably 24 to 26 ounces, that is, bringing it back up to 24 or 26 ounces.

President Wood: Do you mean the total weighting above the grey weight?

Dr. Stericker: No, I am talking in the terminology of the silk weighter. He starts out with a pound of silk and he more or less completely boils that off. If he boils off completely it goes down to about 12 ounces. Then he brings that back up and at somewhere around 24 to 26 ounces, that is, 50 per cent of weighting, it begins to show serious damage.

President Wood: I have seen 60 per cent weighting and it doesn't appear to be damaged, and I wondered whether there was any method of applying silica, because I had been told that beyond 23 or 24 per cent you can't go with tin phosphate weighting alone.

Dr. Stericker: On hair ribbons and on some necktie materials they go regularly to 32 ounces. That does tender the silk in every case that I have known about, but 18 or 20 ounces, if it is well done, and especially where there is going to be abrasion, is about right. Higher amounts than 24 I think will always show tendering unless they have some special process.

I might say that they are also using lead weighting where they get perfectly enormous amounts of weight without tendering.

President Wood: Thank you.

Are there any further questions?

Dr. Pierce: Possibly I can throw a little light on that subject. I want to make one correction in your statement, though. They do not use tin crystals. It is tin tetrachloride. Then in washing it that changes to metastannic acid afterwards with a phosphate. But in case of treating with silicate, later on that will be absorbed to almost any extent and much depends on the structure of the fabric. It is not considered that the silicate tenders the silk but it makes it very brittle by its combination with the tin phosphate that is already there, and in many cases where the fibers cross each other they are actually cemented together, so that when the goods go through a button-breaker or calender they are crushed, and that is what causes the tendering, not the chemical action on the strength of the fiber, but purely mechanical. So different fabric constructions may have different amounts of silicate and one be much stronger than the others because there has been no cementing of the fibers together.

I think that is the nearest explanation we can give you.

Sometimes they will split right open on the tenterframe when they have too much silicate.

President Wood: But don't you think there is a certain amount of tendering caused in the steaming operation also?

Dr. Pierce: There may be.

Dr. Milton Harris: Mr. Chairman, I should like an answer to the question that you asked. Assuming that the weight of the silk is 12 ounces after the soap is boiled off, and it is weighted up to 26 ounces—in other words, it takes on an increased weight of 14 ounces—what per cent of those 14 ounces is silicate?

Dr. Stericker: About 5 ounces, I believe. Would you agree with that?

Dr. Pierce: Three passes in tin would bring you about 25 per cent over par. They generally use four passes of tin and not so much silicate these days.

President Wood: I am afraid we shall have to cut short the discussion at this point.

Mr. George P. Feindel: Just one question: Is it possible to use silicates on cotton piece goods to obtain a permanent stiff finish?

Dr. Stericker: We have some indications that by the addition of other materials it is possible to secure a stiff finish which lasts through several washings.

Mr. Feindel: Do you know what those other materials are that are used with silicates?

Dr. Stericker: We ran some experiments in which we used cornstarch.

Mr. Feindel: Cornstarch in conjunction with the silicate?

Dr. Stericker: Yes. I think I have a small piece here. I am a little bit ashamed to show it and that is the reason I haven't shown it before. I am afraid I haven't it here. It does give a decided stiffening, and this piece has been washed several times.

President Wood: Thank you, Dr. Stericker.

At this point I am going to interrupt the proceedings to appoint John Cosby and Hugh Puckett as tellers and I would ask these two gentlemen to retire and count the votes and report back by twelve o'clock.

The next paper is entitled, "Sulphonated Alcohol Products," and will be presented by Dr. Samuel Lenher, of E. I. DuPont de Nemours & Co., Inc. (Applause)

. . . Dr. Samuel Lenher presented his prepared paper, illustrating with slides. . . . (Applause)

Sulphonated Alcohol Products*

By **SAMUEL LENHER, Ph.D.**

Organic Chemicals Department, E. I. DuPont de Nemours & Co.

THE search for new textile assistants has led to the discovery of a new series of chemical compounds, the sulphonated fatty alcohols. The sulphonated fatty alcohols are half sulphuric acid esters of fatty alcohols; in these compounds we can consider that one of the replaceable hydrogens in sulphuric acid has been neutralized by a primary fatty alcohol radical and the other replaceable hydrogen has been replaced by an atom of sodium. The fatty alcohols from which these sulphonated products are derived are prepared from the catalytic reduction of naturally occurring fats and fatty acids by hydrogen. The synthesis of these fatty alcohols was carried out independently by the Deutsche Hydrierwerke in Germany and by the DuPont Company in this country. The sulphonated alcohols comprise a series of derivatives of the alcohols from ethyl alcohol up to the highest known members of the series having more than thirty carbon atoms in the aliphatic chain. Most of these sulphuric acid esters are new compounds and their properties and uses are being examined for the first time. It has been found that the sulphonated alcohols having from twelve to eighteen carbon atoms in the molecule have soap-like characteristics which are analogous to the detergent characteristics of the common soaps. These soap-like sulphonated fatty alcohols are being marketed under the trade names of Gardinol and Brilliant Avirol products.

Soap is an excellent general detergent when used alone in soft water or when used with the assistance of a mild alkali. Under any other conditions, such as with acids, strong alkalis, or in the presence of metal ions, the detergent action of soap is reduced or even destroyed entirely. The sulphonated fatty alcohols have been developed especially to meet these conditions. These products exert their detergent properties under conditions of strong acidity or alkalinity, and in the presence of hard water, sea water, or of heavy metal salts. These properties have been described in some detail in papers in this country and abroad and are now becoming as familiar to experts as are the properties of soaps.

*Presented at Saturday morning session, Annual Meeting, Dec. 3, 1932.

European experience with the sulphonated fatty alcohols has shown them to be valuable new textile assistants. In this country the sulphonated alcohols are being introduced as general soap substitutes to replace soap where an improvement of any kind over the action of soap can be made. Since the sulphonated alcohols are considered as soap substitutes it is interesting to compare and contrast some of the characteristics of solutions of soaps and of sulphonated alcohols.

Soaps are materials which form solutions in water which have soapy properties. Some of the more obvious soapy properties are a certain slippery feel of soap solutions and a pronounced tendency of the solutions to froth and build up foams. All soaps have the characteristic soapy feel and this soap-like feel is also shown by the sulphonated alcohols. The sulphonated alcohols show the soapy feel less than common soaps because of their lower viscosity and higher solubility. All soaps build up foams on agitation and the sulphonated alcohols also show a strong tendency to form stable foams. However, all solutions which foam do not show soap-like detergent action; for example many dyestuffs, saponin, and penetrating assistants such as the alkylated naphthalene sulphonic acids, foam as much as most soaps but show no soap-like detergent action. Common soaps form alkaline solutions in water. This fact has led to the idea that soaps are dissociated in solution into fatty acid and free alkali and that these materials act more or less separately to exert the observed detergent effect of soap. It is now known that the amount of free alkali in soap solutions is far too small to account for their detergent action. The sulphonated alcohols cannot yield free alkali in solution, and it is clear that some explanation other than the presence of free alkali must be made for the powerful soap-like action of the sulphonated alcohols. Both soaps and fatty alcohols sulphonates act to greatly reduce the surface tension of water and to concentrate at interfaces and to tend to emulsify or carry into colloidal solution, particles with which the solution is in contact.

Commercial soaps, or the alkali metal salts of fatty acids, having from twelve to eighteen carbon atoms in the molecule, form colloidal solutions in water which show great surface activity and pronounced detergent action. These properties have their origin in the nature of the soap particles in water solution. It has been shown, largely by the work of McBain, that soap solutions are by no means homogeneous and that they contain soap particles of widely varying composition. Part of the soap is in solution in the form of colloidal particles, or micelles, and it has been shown that surface activity and detergent action are associated with the presence of these micelles in solution. The remainder of the soap is in solution as molecularly dispersed soap and as fatty acid anion and alkali cation. Only a small part of the dissolved soap is actually hydrolyzed into fatty acid and free alkali, and this hydrolysis takes place only in very dilute solution. McBain has shown by conductivity measurements and osmotic pressure measurements that soap solutions behave like solutions of ordinary electrolytes except that in soap solutions the colloidal aggregates, or micelles, conduct current as well as the alkali ions and fatty acid ions. The micelles consist of soap molecules and water with varying amounts of absorbed fatty acid and alkali ions. Thus in considering the behavior of soap solutions the equilibrium between the soap present in the form of micelles, or in colloidal solution, and the soap present in molecular and ionic form, or in true solution, must be taken into account. This equilibrium between colloid and crystalloid soap in solution is perhaps the most significant property of soap solutions from the standpoint of their detergent action.

It is important in considering the properties of soaps and sulphonated alcohols in solution as detergents to note that whether a certain soap or sulphonated alcohol behaves as a detergent or not depends on the temperature. The soft soaps, or lower fatty acid soaps containing twelve to fourteen carbon atoms in the molecule and the corresponding sulphonated alcohols, which comprise Gardinol WA, show their greatest surface activity and detergent action at relatively low temperatures of below 40° C. The hard soaps, or higher fatty acid soaps containing sixteen to eighteen carbon atoms in the molecule, and the corresponding sulphonated alcohols which comprise Gardinol CA and the Brilliant Avirol products show their greatest surface activity at higher temperatures from 50° to 100° C. This behavior is easily interpreted in terms of the equilibrium between colloid and crystalloid particles in solution. The detergents with short carbon chains give many micelles at low temperatures while at higher temperatures the solubility is so high that the micelles are broken down to crystalloid size and the surface activity is destroyed. The detergents with long carbon chains have such a low solubility at ordinary temperatures that only few micelles are formed while at high temperatures the increased solubility permits the formation of large numbers of micelles. Thus for example, solutions of the sulphonated alcohols in Gardinol WA show great surface activity and detergent action at ordinary temperatures and are found to contain colloidal particles, while at temperatures near the boiling point of water the surface activity has disappeared and the detergent action has become less.

Measurements of the conductivity of solutions of the pure sulphonated fatty alcohols in Gardinol WA show these solutions to behave like soap solutions. Solutions of these alcohol sulphonates show a low equivalent conductance which increases gradually and continuously with dilution until a sharp increase in conductance is observed at 0.00025N. At this concentration the conductance of the solution becomes quite high and is approximately that

of strong electrolytes, as potassium chloride or sodium sulphate. Since at approximately the same concentration the surface activity of the solutions is very slight it is supposed that this increase in conductance marks a dissociation or dissolution of the micelles into crystalloid form and that this change of the micelles into simple molecules and ions causes the loss of surface activity.

The most direct evidence for the existence of micelles in solutions of sulphonated alcohols is given by an ultramicroscopic examination. Solutions of sulphonated alcohols in water were examined with a Leitz cardiod ultramicroscope using both a Siedentopf dark field condenser and a Jentzsch condenser. Solutions were examined at magnifications up to 1450 diameters. Solutions of Gardinol WA showed many small spherical particles which exhibited a very active Brownian movement. Figure 1 shows an ultra-microphotograph of a solution of Gardinol WA at a magnification of 510 diameters. The Brownian movement was much more pronounced than with oleate or stearate soap solutions. Solutions of Gardinol WA showed little or no tendency to agglomerate on standing. The few large particles in the field appeared to be very loose aggregates of several small particles in a network. The field was very dark and showed no evidence of the existence of particles just below visibility. Strong sulphuric acid solutions and strong caustic soda solutions of Gardinol WA appeared the same as solutions in distilled water. Addition of calcium chloride caused an agglomeration of the particles to nebulous clusters made up of long rod-like particles which showed a less intense Brownian movement.

Fig. 1—Gardinol WA Double Powder. 20% solution, freshly prepared, 510 diameters magnification.

Solutions of Gardinol CA, or oleyl sodium sulphonate, gave a bright field with a great number of long needle-like crystals. Figure 2 shows a fresh solution of Gardinol CA photographed at a magnification of 510 diameters. Figure 3 shows a solution of Gardinol CA after ageing a week. The particles were larger than the Gardinol WA particles but still showed a very active vibratory Brownian movement. Solutions with caustic soda appeared the same as those in water, but solutions in sulphuric acid showed some agglomeration to larger rod-like particles. Solutions of Gardinol CA showed a tendency to agglomerate to larger rod-like and spherical particles on standing.

Fig. 2—Gardinol CA Powder, 1% solution, freshly prepared, 510 diameters magnification.

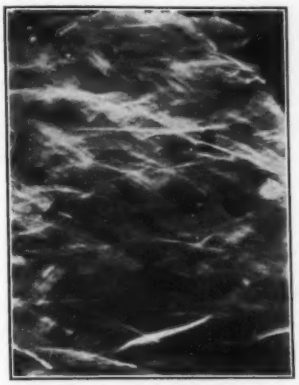

Fig. 3—Gardinol CA Powder, 1% solution, aged one week, 510 diameters magnification.

Solutions of the Brilliant Avirol L142, or mixture of cetyl and stearyl sodium sulphonates, appeared very like solutions of Gardinol CA except that they showed less Brownian movement.

The addition of amounts of sodium sulphate many times that of the sulphonated alcohol had no effect on the particle size.

Solutions of sodium stearate gave bright fields with many large clusters of particles. The clusters had in general a chain-like structure and showed the beading which was noted by McBain. There were relatively few small particles. Solutions of sodium oleate gave light fields showing numerous clusters of chains. Figure 4 shows an ultramicrophotograph of a solution of pure sodium oleate taken at a magnification of 510 diameters. Many of the particles were crescent shaped. The solutions showed a Brownian movement which was less than that observed with Gardinol solutions.

Fig. 4—Sodium Oleate, 15% solution, freshly prepared, 510 diameters magnification.

These ultramicroscopic observations show conclusively the presence of micelles in solutions of sulphonated alcohols. The small size of the micelles in the Gardinol solutions indicates that the solutions are of the sol type. The active Brownian movement of the micelles of sulphonated alcohol shows the viscosity of the solutions to be much less than that of soap solutions since the activity of the observed Brownian movement depends directly on the viscosity of the solution.

Measurements of the relative viscosity of water and of dilute solutions of sodium soaps and of sulphonated alcohols show that the viscosity of the sulphonated alcohol solutions is considerably less than that of soap solutions. This indicates further that the sulphonated alcohols form solutions of the sol type and that the micelles are probably

quite small and contain so little bound water that they do not greatly increase the viscosity of the water solution.

It appears from these observations that solutions of sulphonated fatty alcohols show a general similarity to soap solutions in their physical properties. It is probable that McBain's suggestion that the detergency of soap solutions is associated with the presence of micelles in solution is directly applicable to solutions of sulphonated alcohols. We do not as yet know what the structure of the sulphonated alcohol micelles is, but it can be suggested from the known chemical behavior of these compounds that the micelles consist of molecules of sulphonated alcohol and adsorbed sodium ions with relatively little bound water. Since the sulphonated alcohols in solution show the fundamental properties of common soaps there is a sound basis for advancing these compounds as soap substitutes. The resistance of the sulphonated alcohols to acids, alkalis and heavy metals is so complete that these products open up possibilities for the application of detergents in processes where soap-like detergents could not even be considered for use previously. Clearly the physical and chemical characteristics of solutions of sulphonated alcohols show that they can be used as assistants and detergents on both animal and vegetable fibers over a wide range of conditions.

It is interesting that the sulphonated alcohols which are marketed as the Gardinol products have so far found their greatest use in processing wool. Raw wool which has been processed with Gardinol is very soft and has a lofty open appearance. Wool which has been properly processed with soap may be equally as clean and free from grease as that processed with Gardinol, but it does not have the soft feel or open appearance of the Gardinol scoured wool. It appears that altho Gardinol is very soluble and easily rinsed out of fibers it imparts a character of its own to wool. It has been found that the potassium salt of the sulphonated alcohols in Gardinol WA is very insoluble and that the solubility is not more than 0.1 gram per liter. Since the suint on the raw wool fiber is composed mainly of potassium salts of fatty acids it is possible that in the presence of Gardinol a certain small amount of the potassium salt of Gardinol is formed on the fiber in the presence of the suint and left there to impart the characteristic soft Gardinol finish. The advantages shown by Gardinol keeping wool soft after it has once been scoured do not of course depend on the suggestion just made, but may be considered to be due to the fact that the solubility of the Gardinol permits all foreign matter to be rinsed away from the fiber to leave it clean.

The Brilliant Avirol products show in addition to their detergent properties at elevated temperatures fatty and waxy characteristics which soaps do not show. These fatty properties together with the chemical stability of the Avirol products make them suitable for finishing purposes. It has been found that the finish which the Avirol products give to fibers is quite fast to washing and is a semi-permanent finish for artificial fibers.

The family of sulphonated alcohol products shows a wide range of properties which up until recently had been recognized only in the soap series. In addition, the sulphonated alcohols show a chemical stability which opens up entirely new fields for the industrial application of detergents.

Discussion

President Wood: Dr. Lenher's very interesting paper is open for discussion.

Dr. Milton Harris: I should like to ask a question, with reference to the general standard wash test, soiling a piece of cloth with carbon black and oil. How do the detergent properties of the Gardinols compare with soap in a case like that?

Dr. Lenher: Very well. We use that test in our laboratory for comparing the detergent properties of soap and the Gardinols and various new materials which come to our attention. We don't use woven materials exclusively because we have found such a variation in the weaving and in the twist of the threads that we have changed over to a felt, and we impregnate a wool felt with a mixture and use that in our scouring tests.

In that test, in distilled water, Gardinol shows up about the equal of a very high grade soap. Under all other conditions we have found the Gardinols show a remarkable advantage over soap.

Mr. Manning: I should like to ask whether these sulphonated fatty alcohols have been used to replace sulphonated oils in such cases as coning oils and what the effect in the boil-off in Scott-Williams knitting of hosiery would be if the change was made.

Dr. Lenher: We don't know that the sulphonated fatty alcohols have as yet been applied to replace sulphonated oils in preparing coning oils. From their rinsing characteristics we think they are ideal materials to use in the formulation of coning oils.

Mr. B. A. Usinoff: I should like to ask to what is the cleansing action of sulphonated alcohol solutions due, when used as substitutes for soaps? As you know, we have two kinds of soap, soft and hard. Which one of these will give more molecules of soluble soap in water, and less in colloidal form?

Another question: Does hard soap give more soluble molecules of soap than soft soap?

Dr. Lenher: The soft soaps give fewer micelles at room temperature than do the hard soaps. At higher temperatures, soft soaps may contain no micelles at all. As a matter of fact we know that the laureate soaps at the boil are optically empty under the ultramicroscope and if

they are in true solution they are not detergents whereas the stearate soaps show the maximum number of micelles very close to the boil and act as powerful detergents at about 212 degrees Fahrenheit.

The addition of calcium chloride or artificial hardness to solutions of the fatty alcohols causes a slight increase in the size of the micelles. There is an increase in the size of the micelles on the addition of strong sulphuric acid or strong caustic soda. The size itself remains unchanged. Soaps of course are coagulated by hardness.

Mr. Schroeder: Are the Gardinols of value in bleaching as buffers, because of the sodium in them?

Dr. Lenher: In peroxide bleaching?

Mr. Schroeder: Yes, or in chlorine bleaching.

Dr. Lenher: As far as we have been able to find out the value of the Gardinols in bleaching is in their penetrating action. They tend to assist in the leveling of the bleaching. I don't know that they have any buffering action of their own on the bleach solution. Of course, they are neutral.

Mr. Schroeder: Are they better penetrants than soap?

Dr. Lenher: In distilled water Gardinols show a penetrating action which is about that of soap. Of course, soap is an excellent penetrating assistant and so are the Gardinols. The Gardinols in their penetrating power exceed any of the other synthetic penetrating assistants which we have had occasion to test, including the alkylated naphthalene sulphonic acids.

Mr. Schroeder: What is the effect of temperature? Is the power raised, or increased, in the case of Gardinols?

Dr. Lenher: In the case of all penetrating assistants it tends to decrease, and that is also true of the Gardinols—it is a general property.

Mr. Hart: How do the sulphonated alcohols compare with the esterified fatty acids such as Igepon, so far as detergency, surface tension, etc. are concerned?

Dr. Lenher: The Gardinols show a slightly greater lowering of surface tension of water than Igepon, in equivalent strengths.

Of course, the lowering of the surface tension of water is not an entirely satisfactory criterion of the detergent action of any material. As I suggested, many materials show a powerful depressing action on surface tension which have no detergent properties whatsoever.

Mr. Hart: Do the sulphonated alcohols behave the same as ordinary sulphonated oils when they are boiled with mineral oils? That is, do they split off their SO_3 like all the esters do?

Dr. Lenher: They can be split by boiling with sulphuric acid of greater strength than 7 per cent. Up to that point they are quite stable and are not hydrolized.

Mr. Hart: How do you determine the amount of SO_3 added onto your product? What is the method of analysis?

Dr. Lenher: Our method of analysis consists of a hydrolysis of the product, an analysis of the organic and inorganic sulphate.

Mr. Schroeder: The same as sulphonated oil analysis?

Mr. Hart: Splitting with mineral acids?

Dr. Lenher: Yes.

Dr. Powers: Can you determine the pH of solutions of low concentration and high concentration of the Gardinol CA and Gardinol WA?

Dr. Lenher: At ordinary temperatures, yes. They are very close to 7.

Dr. Powers: And even up to the 15 per cent and 20 per cent solutions under the microscope?

Dr. Lenher: Yes.

Mr. Hart: What is the difference in the chemical composition between Brilliant Avirol and Gardinol?

Dr. Lenher: Well, the Avirol products are the higher members of the Gardinol family. Their chemical constitution is the same. They are the half sulphuric esters of the higher fatty alcohols, having 18 carbon atoms in the molecule.

Mr. McMahon: May I ask with regard to the hydrogen and hydroxyl replaced by sodium, if you use that in hard water, won't that sodium be replaced by another metal that may be in the water such as potassium magnesium?

Dr. Lenher: Yes, there is some tendency for the Gardinol to undergo a metathesis reaction but not to the extent that that occurs in soap, because the magnesium and calcium salts are as soluble as the sodium salt. Consequently, there is no separation of the calcium and magnesium salts which would tend to drive the reaction in the direction of the calcium and magnesium product. There is a balance in solution between the calcium and magnesium and sodium salts of the Gardinol in hard water. The calcium and magnesium salts of the Gardinol exert a detergent action which is as great as that of the sodium salt.

We have studied that by preparing a pure magnesium derivative of Gardinol and using it as a scouring agent.

Mr. McMahon: It precipitates off?

Dr. Lenher: As a matter of fact, in one or two tests we thought it was a little better than the sodium derivative.

Dr. Harris: May I ask one more question?

Does the ability of Gardinol to act as a detergent agent or the ability of wool to absorb Gardinol vary in pH?

Dr. Lenher: Yes, it does. The real detergent action of Gardinol on wool is shown best in the presence of a mild alkaline material which can take care of the fatty acids which are present on the wool fiber, of course. That means that at a pH above 7 we found soda ash or a

modified soda ash containing a variable amount of sodium bicarbonate, when it is desired, to be the best alkali to use in conjunction with the Gardinols for wool scouring.

As regards the substantivity of Gardinol for the wool fiber, at strong acidity, at a pH of about 1 to 2, Gardinol is absorbed by the wool fiber, as you would expect with a sulphonated compound. At a pH of about 3 to 5 there is a mild absorption of Gardinol, and above a pH of 5 we haven't been able to detect any substantivity of the Gardinol. The absorption is about that of the amount of solution which is taken up by the wool.

President Wood: Thank you, Dr. Lenher. (Applause)

The next paper will be read by Mr. H. M. Chase of Riverside & Dan River Cotton Mills. He is the chief chemist and superintendent of dyeing in that institution and is also a member of the Piedmont Section. Mr. Chase will talk to us on, "The Detection of Heavy Metals and Traces of Impurities in Cotton Fabrics." Mr. Chase! (Applause)

[Ed. Note. Mr. Chase's paper together with other papers and their discussions will appear in forthcoming issues]

BANQUET SESSION

Annual Meeting Saturday Evening, Dec. 2, 1932

Toastmaster—A. R. THOMPSON, JR.

. . . Following a musical entertainment, Mr. J. E. Latham delivered an address of welcome. His remarks were replete with colorful anecdotes of the South, and breathed a spirit of hospitality. In part, he said:

"Mr. Toastmaster, Ladies and Gentlemen: I have the honor of saying a few words on behalf of the Piedmont Section of the Carolinas to the chemists and colorists of the neighborhood and those who come here from afar.

"We are glad to have you in North Carolina in such extensive numbers. It is a great thing. North Carolina has grown mightily in its development of the textile business, of which you are a very important part.

* * *

"Yours is a great business. It has meant much to the United States. Those of us who have had to do, as I have had to do all my life, with the cotton merchandising business and the cotton manufacturing business know what it means to have the chemists and the colorists ready at hand with the tremendous development that has taken place in their sphere during recent years.

* * *

"I have the authority of His Honor, the Mayor, the President of the Women's Club, and others here to extend to you a welcome, but extending to you a welcome to Greensboro is hardly enough because we are only what we believe to be a fair representation, perhaps a fine representation, I might say, of the Piedmont Section of the South. We are glad to have you with us. It is a delightful thing to have you with us." (Applause)

* * *

. . . Toastmaster Thompson called upon Past President Wood to respond to the address of welcome. Past President Wood addressed the gathering in his usual happy vein. A portion of his remarks follows:

Past President Wood: Mr. Toastmaster and Friends: Some one has defined a pessimist as a man who wears both belt and suspenders, but after hearing the cheerful remarks of Mr. Latham, I am quite sure he wears neither. (Laughter)

* * *

This is the third time that this Association has had the pleasure of meeting in the South. We have very pleasant recollections of our convention at Charlotte in 1926. In 1930 we met at Chattanooga and we have a very vivid memory of the wonderful reception that you Southerners gave us there. And as to this convention in Greensboro in 1932, words fail me. I can't say enough in praise of what you have done to welcome us.

Just a few words, in retiring, as to the future of the Association. I hope that before many months are gone by we shall increase our membership in the Association because the success of this Association or any association depends not only on the hard work of its officers and council, it depends on the hard work of every member of the Association.

A matter came up at the Annual Meeting today and at the Council meeting yesterday which has been very close to my heart for some time and that is the sponsoring of student sections. We have two student sections in the Association, one at the Lowell Textile Institute and one at the North Carolina State College, both of which are in flourishing condition but which, I believe, could be even more flourishing if the senior members of the sections closest to those student sections would take a little more vivified interest in their proceedings.

I think the older members of the Association should feel a sort of moral responsibility toward these young men who will be sitting here at these tables when we are dead and gone.

As Professor Grimshaw pointed out in his paper this afternoon they are the textile chemists of the future, the students of today, and a committee will be appointed by our President to oversee the work of these student sections, by overseeing in turn the work of committees which we are hoping will be appointed by the senior sections in their vicinities. It is not too much to hope therefore that we shall have many more student sections in the future. We have a great many more textile schools in the United States and, without doubt if they are properly sponsored by responsible people they will flourish just as well as the two sections which we now have in the Association.

I hope by the time we come to next year's convention we shall be able to have a full report from that committee of considerable progress.

Another thing: the research work of the Association has been going on now ever since we started operations twelve years ago, and very successfully. I think the record will bear inspection, in comparison with the work of any similar association in the United States. This is due to the very efficient oversight of the Research Committee headed by Dr. Olney, who has been very faithful in his labors, and in fact the whole Committee has shown an interest which would surprise some of the members of the Association not on the Research Committee. Their work far surpasses the meagre reports which you have in the Proceedings from time to time.

In order to carry on the research work, of course, funds are necessary and it does appear as if our funds will be hardly adequate during the coming year unless we can do one of two things, or maybe both, and that is raise a little more by having many members take upon themselves the responsibility of assuming sustaining membership at a charge of $10 over and above the regular fee per year, or induce the Textile Foundation to increase their grant to us. I hope that we will be able to do both of those things.

Again, research work does not depend only on funds and on the work of the Research Committee. It depends on the hearty cooperation of every member of the Association. All of you can help by forwarding your ideas to this Committee. We are all interested in our profession. otherwise we wouldn't be members. We can show our interest both by trying to increase our membership—by inducing other textile chemists to join our Association—and by furthering the efforts of the Research Committee.

Let us do whatever we can. We are all imbued with that heaven-sent quality of curiosity and curiosity is really responsible for most of the good things that we have in the world today. If it hadn't been for the curiosity of Priestley, Perkin, Lavoisier, Lieberman, Steinmetz and Edison, where would the textile chemist of today be?

I say, Thank Heaven for curiosity and for the curiosity of these men and for the curiosity of every textile chemist. It has been the mainspring of all research work.

I should like to express the thanks of the whole Association for the splendid reception we have been accorded in Greensboro, for the very fine welcome which was given to us by Mr. Latham, and I know I echo the sentiment of all visiting members when I say we have certainly enjoyed the Twelfth Annual Convention as well as any convention the association has ever held.

In bidding you farewell as your President I should like to tell you that I have had a most enjoyable two years of association with your officers and with all of you, and in parting let me say, "Farewell," and remember the words of the old proverb, "Times change and we with time, but not in the ways of friendship."

Thank you. (Applause)

. . . Following several musical selections, Mr. W. S. Lee, Vice-President of the Duke Power Company, addressed the gathering. Mr. Lee complimented the textile chemists and colorists on their work in the textile field, which he said was a most important contribution. He commented on the great future there is for cotton textiles, and said that the textile chemists and colorists were helping this industry along by creating attractive and beautiful styles, causing the fabric to become more popular every day. Extolling the textile chemists for their creative ability, Mr. Lee said that by creating new patterns and new styles they were popularizing the cheapest clothing that can be made on earth. Interpolating his address with several humorous narratives, Mr. Lee went on to a discussion of the question of taxation. He stated that the depression through which the country and the world is passing was largely due to excessive taxation which has stopped industry and commerce, caused an accumulation of surpluses, kept new money out of business, and put millions of men out of work. Mr. Lee quoted figures as to the amount paid in taxes to the Federal Government, states, counties, municipalities, in 1914 and the amount being paid in 1932. He spoke of the disastrous effect taxation has had on the railroads of North and South Carolina and of the country generally. After discussing this question at length, Mr. Lee closed by making the statement that opportunity still abounds in America and that through the cooperation of scientific thinkers and the trained men and women of the nation we will work out of our present situation. . . .

. . . Following a humorous address by the Secretary of the Greensboro Chamber of Commerce, and several musical selections, Dr. Frank Graham, President of North Carolina State College, addressed the gathering, commenting upon the unity existing between the states of North and South Carolina, and extolling the virtues of these two states, specifically referring to the larger cities in these states, their various industries, their progressive spirit, the loyalty of their citizens to their state and the South. Dr. Graham went on to discuss the national aspect of industry and the international aspect, making the statement that we must look at things not only from the Southern standpoint, or the national standpoint, but from the world standpoint. In no other way, said Dr. Graham, would we work out the depression which exists throughout the world today, the first world economic depression that has ever been experienced. Continuing along this line Dr. Graham said that in working out of our present situation we would have to call upon not only the phy-

sical scientists—the chemist and other scientists—but upon social scientists as well. . . .

The final speaker of the evening was the newly elected President of the Association, Dr. Robert E. Rose.

Dr. Rose spoke briefly, as follows:
Mr. Toastmaster—Gentlemen:

Today I have had an extraordinary experience. I have been elected President of the American Association of Textile Chemists and Colorists, and that has happened only to three others in all the history of the world. In addition I can claim that only one other man has ever been made President in the South. The fact that I have been chosen implies the faith of my colleagues in me. The happy circumstance that I am here in the South, as I take over my new office, I wish to see as an augury of my close association with my friends in this part of the country.

It is apparent from what I have said, that as President of this Association I have no past, and since the time arrow moves, as we know it, only in one direction (a fact which seems to disconcert the modern mathematical physicists, who have become our prophets) it follows that I must in addressing you speak of the future, but to look into the future is to prophesy, and that is among the most poorly developed of human functions. Indeed, as we have seen during the past three years, the future never develops as even the wisest amongst us are able to foresee.

I once made a study of the methods of prophets and I find that there appeared to be equal justification for all the ritual ever used, it does not matter whether reliance was placed on the examination of the viscera of freshly killed fowls, or consultation with an oracle, or the reading of graphs, the success was always the same and exactly equalled that of a good guess. I must qualify that statement to the extent that I was able to find what seemed to be one exceptionally successful procedure. This was to get in touch with the devil and barter your soul for a guaranteed future. Perhaps you know the grim story told by Lord Dunsany of the ambitious business man who decided that a present triumph over his commercial rivals was worth eternity at the devil's mercy. He bargained that for his soul he should receive but one thing, the file of newspapers that would issue one year into the future. He wanted an exact record of what was to be and he could think of no more certain way to get it than this.

At twelve on new year's eve, as the bells rang, the devil fulfilled his bargain. He laid the file on the table and departed. The business man with the curiosity of a mortal looked as far into the future as he could. He looked at the paper for that day one year hence. He scanned the summary of the years market fluctuations and he was filled with amusement at the tremendous power that was his, because that list showed how utterly at sea all the prophets were. Then he moved backwards, reversed the time arrow, and looked at the news of next summer. Again he saw how easily he could acquire a fortune and power and fulfill his every ambition. Being a practical man, it then occurred to him that he ought to get ready his list of orders for his broker at the opening on the second day of the year. He turned to the paper of that date and his own name caught his eye. Quickly he read the paragraph which stated that he had died on the night of the New Year. So you see you can not beat the devil, and since he seems to be the only reliable source of information regarding the future I refuse to prophesy.

Of course, I may speak of some of the obvious problems facing us as an Association. The first of these is what I may call coherence. We are spread geographically over a very wide area, so wide that our cooperation is hampered, and also we are spread very thinly among the group we must react upon in order to be successful. We can increase our effectiveness by doing all that we can to offset this difficulty of distribution. The effectiveness of the organization will depend upon what each one puts into it, that is a mere truism, but I have lived long enough to have passed beyond the stage of altruism that considers it virtue to assist everyone else, even though the other fellow does not want to be assisted, or does not help you to assist him, let us put it that way. If you will permit me to do so I would liken the Association to a volume of gas (laughter). The effective pressure then, is that of the average energy of the members of our group, and while a few rapid molecules, dashing here and there may produce a tremendous effect in their immediate path, they fail to increase the total effect of the mass to any great extent, and only a steady pressure will produce results when exerted on what I will call the viscous immobility of the uninspired. Using this same figure of speech; cooling, that is the slowing down of the molecular motion in any part of the gas, will lead to a cooling in every part before the disturbance is equalized, and therefore, every part of the Association is as important as every other. We have great difficulties to face, but I hope, that when I come to report at the end of the year on our progress, I may be able to tell you that our success has been even greater than we dared hope, as we look into the future today. (Applause)

MEETING, NORTHERN NEW ENGLAND SECTION

THE first meeting of the 1932-1933 season of the N. N. E. Section was held Nov. 5th, 1932, at Riverbank Court, Cambridge, Mass., with Mr. Leverett C. Putnam, Chairman of the Section, presiding. There were 68 present. During a brief business session, it was voted to hold bi-monthly meetings during the current season, alternating the location of the same between Cambridge and Shawsheen Village. This was recommended by the Sectional Committee because it was evident that those in attendance at most of the meetings previously came from these two localities, being about equally divided in numbers.

Chairman Putnam then proceeded with the program of the evening introducing as the speaker Dr. Samuel Lenher of the Research Staff of the E. I. du Pont Co, who delivered a paper on "Sulphonated Fatty Alcohol Products." An enthusiastic discussion of this new subject followed the presentation of the paper.

Respectfully submitted,

C. L. NUTTING,
Secretary.

Discussion on Sulphonated Fatty Alcohol Products*

By **SAMUEL LENHER, Ph.D.**
Organic Chemicals Department, E. I. du Pont de Nemours & Co.

THIS paper has been published in the Proceedings of the Association in the AMERICAN DYESTUFF REPORTER, December 5, 1932, pages 693-321, and was originally planned for presentation before the Northern New England Section but through the courtesy of the Northern New England Section Dr. Lenher also presented the paper before the Rhode Island Section, October 28th and it has already been published as a part of the records of that meeting. For that reason the paper is not reprinted at this time but the full discussion which took place at the Boston Meeting November 5th follows.

Discussion

Mr. Putnam: I think we all feel grateful to Dr. Lenher for his paper. It is a timely subject for the present. We are all interested in something new that we don't know too much about. We are here to learn. Dr. Lenher, I feel sure from what he has told me, is quite willing to answer questions.

Mr. Burnham: Is Gardinol WA precipitated with Barium?

Dr. Lenher: No. Gardinol WA doesn't precipitate Barium.

Mr. Burnham: You spoke about Gardinol not being used for carbonizing with oil of vitriol or aluminum chloride. What is the reason?

Dr. Lenher: We do not recommend the Gardinols for carbonizing for the following reasons: In sulphuric acid carbonizing the Gardinol appears to be substantive towards the wool fiber just as an acid dyestuff. The Gardinol is exhausted from the carbonizing bath and probably would be uneconomical to use. We do not know that that is the case in practice but that is the action it would have. Gardinol does act as a perfectly satisfactory penetrating assistant in sulphuric acid carbonizing and the Gardinol is not broken in the carbonizing bath because the product is stable in 7% sulphuric acid at temperatures used in sulphuric acid carbonizing. Gardinol forms an insoluble aluminum salt which makes the Gardinol unsuitable for aluminum chloride carbonizing. In hydrochloric acid gas carbonizing the Gardinol will be broken to form the free fatty alcohol and sodium sulphate.

Mr. Durfee: If I bought a shirt that looked pretty but was finished using Gardinol, how long would it stay that way? Is there any permanence to it? Would it resist washing?

Dr. Lenher: The finish would last as long as the Gardinol was on the shirt. It would remain through one washing but I doubt if it would remain through many.

Mr. Christison: I'd like to ask if there is any method of detecting Gardinol products in goods. In other words, if you were handed a sample of cloth or wool, could you

*Discussion at meeting of N. N. E. Section, Nov. 5, 1932.

tell if it had been scoured in the conventional way with soap or scoured with a member of the Gardinol series?

Dr. Lenher: It would be difficult to tell. I don't know of any means of identifying a piece of goods which had been scoured with Gardinol, granted that the soap scouring is perfectly satisfactory, and that there are no obvious faults produced by the soap to differentiate the two.

Mr. Christison: You mentioned that the free Gardinol was substantive to wool, acting perhaps like an acid dyestuff. You might call it a colorless dyestuff. Could you detect it?

Dr. Lenher: The way we tested the exhaustion of the Gardinols is to measure the penetrating properties of solutions of known strength that have been in contact with wool. The penetrating properties, that is the strength of solutions, were measured before the introduction of wool tops, and after, the amount of Gardinol left in solution was determined by the difference. We could not use a chemical analysis.

Mr. Christison: One more thing about Gardinol. The claims that have been made for it to a mill man seem miraculous. For instance, the wool we get may be only half clean fiber and the rest of it is all sorts of dirt and grease and it is hard to see how a little bit of Gardinol in all the extraneous material could have any effect. It must be so or you could hardly make the claims that you do for it but it certainly does seem quite miraculous that a little bit of Gardinol in all that dirt should have the effect that it does.

Dr. Lenher: The Gardinols do have very powerful detergent properties. We have only had opportunity, as yet, to make comparisons between the detergent properties of Gardinol and soap in one or two instances. We have made the comparison in the scouring of raw wool and there the detergent properties of Gardinol are from eight to 20 times those of soap. This means that a certain amount of soap can be replaced by a certain lesser amount of Gardinol. It is very difficult to evaluate quantitatively. Judging by the amounts of soap and Gardinol you have to use in wool scouring, the detergent properties are about 8 to 1, to 20 to 1 for this particular purpose. Now in very soft water, of course, in satisfactorily scouring linen or cotton piece goods the Gardinol shows up to be about as effective as soap. Soap is excellent and Gardinol shows no advantage. As soon as you approach conditions where the soap is broken down, as with hardness or acid or strong alkali, the effectiveness of Gardinol shows up immediately.

Mr. Zillessen: Don't you have in mind there that very small amounts of Gardinol have the same effect as soap in the mechanical removing of dirt in the wool?

Mr. Christison: In the case of Gardinol, there is apparently so little there and the solution apparently has no increased viscosity, it is hard to see how it is removed mechanically. You can conceive of soap being viscous enough to retain the dirt particles and wash them away, but in the case of the Gardinol there must be some other action than that.

Dr. Lenher: The advantage shown over soap as to its emulsifying and dispersing action is not due to any physical property of Gardinol solutions. They are much more fluid than soap solutions. They don't have the body of a soap solution and in some instances, this fact limits the application where you need the mechanical action of a heavy solution.

Mr. Christison: You made a remark about Gardinol not being very useful in fulling. What would happen if you used Gardinol in conjunction with an acid such as formic, and tried to full in an acid bath?

Dr. Lenher: We do not have any experience ourselves with acid fulling. It has been recommended in European practice and it is said that it works satisfactorily there. In outlining the uses of Gardinol as I did briefly, I mentioned only uses where we have had actual experience. I assume you are familiar with the published literature on the subject and I am giving you here only our first-hand experience.

Mr. Morrison: As usual, when new and supposedly good products come along, the market is flooded with cheap imitations. Have you any suggestions as to the procedure that a chemist could use to identify the Gardinols in such mixtures?

Dr. Lenher: Unless there is a fair amount of Gardinol in the product it is rather difficult. We have to do it ourselves, we know how difficult it is to identify it. The easiest way is to break down the Gardinols with hydrochloric acid and determine the boiling range and acetylation value of the alcohol and get the idea of its average molecular weight.

Mr. Durfee: In this matter, I think the average soap is supposed to do as well as it can when it gets to 1 part in 400 of water. About how much of this Gardinol would develop this maximum?

Dr. Lenher: .05% of Gardinol lowers the surface tension of water to 28 dynes.

Dr. Chapin: How do you measure the surface tension?

Dr. Lenher: The surface tension is measured by the duNouy ring tensiometer method.

Dr. Chapin: How much soap and Gardinol should be used in hard water?

Dr. Lenher: The action of Gardinol with the soap solution in hard water is to hold the calcium and magnesium salts in suspension in the liquid. Now, how much Gardinol is necessary to keep the particular solution in suspension depends on the hardness and temperature. The Gardinol acts very effectively to keep the calcium and magnesium salts in suspension.

Mr. Elphick: You spoke about retarding dyeings. Have

you any tabulations of what colors are retarded most in dyeings by the Gardinol solution? If you have three or four different colors in one dyeing, do you know which would be retarded most by the Gardinol solution?

Dr. Lenher: No. We haven't gone over the list quantitatively yet. The retarding action is very much less than glue, for example, except in the case of rayon dyeing where the effect of the Gardinol is pronounced.

Mr. Elphick: We have found it retards some of our shades more than it does others.

Mr. Durfee: While we are here, I think we would all like to know what the medical effects of this Gardinol are. Is it good for anybody to eat? Is there any harm in it? We have to handle it you know.

Dr. Lenher: Gardinol is not toxic. I don't think you would want to take any large amount of it because of the tendency it has to foam. From a physiological standpoint, it would act as a mild laxative. Gardinol is not an irritant to the skin. It is powdered in the present form and dusts about a great deal. When you take a scoopful from a drum of Gardinol, you immediately begin to sneeze. But, Gardinol doesn't have any irritating effect on the skin. Some people are sensitive to olive oil soaps and get dermatitis from them. I assume that as many people are affected by Gardinol CA as by olive oil soaps.

Mr. Pulsifer: What effect has it on the shrinkage of wool?

Dr. Lenher: You mean actually removing small amounts of wool fiber?

Mr. Pulsifer: Yes.

Dr. Lenher: Gardinol itself does not have any solubilizing action on the wool fiber. You can use it alone as a soap, but not as an alkaline detergent. In scouring wool with Gardinol instead of soap we find that you can use smaller amounts of soda ash and get a smaller wool shrinkage.

Mr. Nutting: You spoke about the use of these Gardinols in connection with peroxide bleaching. We have been taught in the past that silicates and pyrophosphates have a stabilizing effect on the peroxide bath. Is that act beneficially in the peroxide bath or merely as a wet- the manner in which you meant that the Gardinols would ting out agent?

Dr. Lenher: I think the action is a wetting out action. We have no evidence of any stabilizing effect. That claim is made for some similar products but we ourselves don't know that that is the case.

Mr. Ross: What is the comparative cost of Gardinol against the soap?

Dr. Lenher: Gardinol costs less than $1.00 a pound and you know the current price of soap.

Mr. Ross: What sort of product would you get if you neutralize in caustic potash in one instance and ammonia in another in place of the soda?

Dr. Lenher: If you neutralize the sulphuric acid ester of the alcohol with caustic potash you get a product with a lower solubility than with the sodium salt. It is rather curious. The ammonium salt is very soluble and shows detergent properties that are entirely analogous to the sodium salts. They show no advantage however.

Mr. Burnham: What is the use of this product along with acid in acid milling and especially their character as to being either exhausted or thrown out as an acid color and I would say in the use of similar products?

Dr. Lenher: In acid milling they do tend to weight the goods slightly. Take a soft felt and full it with acid and a Gardinol product after coloring. If you do not rinse too much after the felting you notice a slight increase in weight in the material so it would seem to bear out your statement that the Gardinol is taken up somewhat. With Gardinol you are able to take the goods in the acid and spot them with a Gardinol solution and remove grease spots. Until the Gardinols came out spotting was a serious matter in acid fulling and if you got grease on the goods you were practically stuck for a means of getting it out.

Question: Regarding another angle you didn't mention, have you made any experiments in wool oiling previous to putting it through the mill, that is, replacing the wool oil?

Dr. Lenher: No, we are working on that now. As regards the absorption by the wool fiber, Gardinol is absorbed only under a strongly acid condition of a pH of 1 to 2, at a pH of 2 to 5 the absorption of Gardinol from solution is rather slight, and above a pH of 5 right up to strong alkalinity, the absorption continues to be just about that of the amount of liquor held on the fiber.

Dr. Chapin: To what extent has Gardinol been considered for use in laundries? We are told that, particularly in Cleveland, Ohio, laundries suffer a lot from hard waters.

Dr. Lenher: I think there it is probably purely a question of price because the Gardinol is excellent when used in a home laundry. I have used some of it around our household. My wife uses it for home laundry purposes and finds it excellent. But, how the cost compares, I don't know.

Dr. Chapin: I suppose the purchaser for a household would have to have it diluted or have it in some physical form other than the powdered form.

Mr. Putnam: What are the relative merits of Gardinol in scouring wool pieces as against soap? Would it remove chalk stains, slubby and greasy spots from greasy yarn as well as soap does?

Dr. Lenher: We have been able to clean the grease

from woolen piece goods but not remove chalk marks completely.

Question: Many tooth pastes contain soap. I wonder if you have tried to interest the tooth paste manufacturers in the use of Gardinol in place of soap?

Dr. Lenher: We have not as yet tried to interest them.

Dr. Draves: I tried two ounces in a bath tub and it prevented the "ring." (Laughter.)

Mr. Elphick: Last night I took home some Gardinol, put some in the bath tub and ran hot water in the tub for my son's bath. He got in and said "I am getting a hush bath tonight." When he got in you couldn't see him for the foam and when he got through you couldn't see any ring around the bath tub.

Mr. Hayes: To what extent has Gardinol been used in starching pastes?

Dr. Lenher: We have not much experience in starching pastes.

Mr. Elphick: I have been using it. We use it in sizing paste at our plant. We had been using 30 pounds of soap and we began using Gardinol this week. We cut the soap down and are now using ½ pound of Gardinol and having a fine finish.

Mr. Burnham: In scouring wool, say you used 5 parts of soap and 3 parts of soda ash, how would you work with Gardinol in place of that formula on raw wool?

Dr. Lenher: I can't answer that question in that form. You don't give me enough information. We find that the type of scouring with Gardinol varies with the scouring and the shrinkage of the wool. If you could tell me what type of machine you would use, I think I could answer your question.

Mr. Burnham: 5 parts of soap to 3 parts soda ash, just raw wool.

Dr. Lenher: We have never had to figure our proportion as 5 to 3, I will have to think them out. We would use a proportion of soda ash to Gardinol roughly, very roughly, 20 to 1, 10 to 20 to 1.

Mr. Putnam: Any more questions? If not, I think we can all extend our speaker a vote of thanks. We have all enjoyed his paper and it has been very profitable. It is a very timely subject and I think we are all interested in it from various angles. If there is nothing else to come before the meeting we will call it adjourned.

LOWELL TEXTILE STUDENT SECTION MEETING

THE first meeting of the Lowell Textile Student Section was held at the Lowell Textile Institute on December 15, 1932, at 3 P. M.

The guest speaker was Mr. H. R. Tisdale of the American Dyewood Company who gave an interesting paper on Natural Dyestuffs.

Open discussion was held following the presentation of the paper.

The meeting was attended by student members and the students of the three upper classes.

Respectfully submitted,

RAYMOND L. MATTHEWS,
Secretary.

SEVENTY-EIGHTH MEETING, RESEARCH COMMITTEE

THE Seventy-eighth Research Committee meeting was held in the King Cotton Hotel at Greensboro, N. C., December 2, 1932. The following were present:

L. A. Olney, *Chairman;* Wm. H. Cady, Harold M. Chase, Howard D. Clayton, Geo. P. Feindel, A. Newton Graves, Jos. F. X. Harold, Milton Harris, Ralph Hart, Henry Herrmann, E. H. Killheffer, Hans Meyer, Wm. R. Moorhouse, Donald H. Powers, Robert E. Rose, Wm. C. Smith, Arthur R. Thompson, Jr., P. J. Wood.

Mr. Clayton read the report of the Sub-Committee on Shrinkage of Textiles.

Mr. Ralph Hart reported that the sub-committee on Sulphonated Oils had tentatively completed its work as far as the determination of water was concerned, and was now working upon the determination of SO_3 in sulphonated oils.

Mr. Wm. H. Cady reported for the sub-committee on Light Fastness.

The chairman reported in regard to the work of the Research Associates and Mr. Smith and Dr. Harris, who were present, made brief reports.

The chairman went into some detail concerning the work which had been made possible through the allocations of the Textile Foundation. Much of the work has still to be completed particularly that concerning the carbonization of wool, and the application of the Iso Electric point of wool and silk, and the principle of electrophoresis to the mechanism of the dye bath.

During the discussion of possibilities for new subjects for research work Mr. H. M. Chase described with considerable detail the possibilities which might be opened through a thorough study of vat dyes and their application to cotton.

The chairman stated that through a questionnaire he was endeavoring to get the views of each member of the Research Committee as to possible research subjects that would be of interest to the members of the A.A.T.C.C. in an inclusive way, i.e., not to a selected few but to the general cross-section of the whole Association, and that he would be able to report at the next meeting with considerable detail as to the replies received.

The meeting adjourned at 5:30 P. M.

Respectfully submitted,

A. NEWTON GRAVES,
Secretary.

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THE SALES TAX

THE possibility of the passage of a manufacturers' sales tax by the present lame-duck session of Congress is considered remote by usually well informed political observers. Yet there will be exceedingly strong pressure applied for the enactment of such legislation. President Hoover, in his recent message to the Congress, recommended the passage of a general manufacturers' sales tax, foodstuffs excluded, of 2¼ per cent. Many believe that before any such measure was passed clothing would also be exempted, in which case the tax would have no direct bearing on the bulk of the product of the textile industry. As long as there is a possibility that clothing will be subjected to a sales tax of this kind, however, it is fitting for manufacturers in the industry to decide on a firm policy which they will adhere to in the event the threat becomes an actuality.

It is obvious that if they are to do this job properly they should start immediately informing their customers that if the tax becomes a law it will be passed on and not absorbed by manufacturers. Such a policy is recommended by the National Association of Hosiery and Underwear Manufacturers, which also recommends that any sales tax enacted be shown as a separate item on manufacturers' bills. A number of mills are already stamping their orders with a clause to the effect that prices quoted are exclusive of any sales tax that may be enacted. All buyers will naturally try to insist that the manufacturer absorb any tax of this nature; some of them are attempting to insert such a condition in orders now being placed.

All this bother would be eliminated if any sales tax legislation to be passed by Congress were specific as to who should pay the tax. It should not be asking too much of Congress to request that any law of this nature contain definite instructions as to who the payee is to be.

A sales tax is ordinarily understood to be one intended to be paid by the ultimate consumer. If this is the case, why not frame legislation which says so unequivocally? Why not a direct tax on all sales at retail, with the retailer acting as collecting agent for the Government? Such procedure would present administrative difficulties—there are many more retailers than there are manufacturers in the country—but these difficulties should not be insurmountable.

Presumably a manufacturers' tax is under consideration because of the relative easiness of collecting such a tax. Yet it is difficult to escape the suspicion that in the minds of some politicians the label "manufacturers' sales tax" will avoid difficulties with their constituents which would follow the politicians' vote for a "consumers' sales tax." Perhaps there exists a sneaking suspicion that describing the projected measure as a manufacturers' sales tax will force at least some manufacturers to absorb the tax. Most manufacturers today are in no position to do any absorbing of a sales tax, even one as low as 2¼ per cent. In one way or another, any "manufacturers'" sales tax enacted will eventually be passed on.

If it is passed on, how can pyramiding be prevented? The measure under consideration by Congress last spring attempted to eliminate the possibility of pyramiding by making only finished merchandise, not raw materials or partly manufactured products, subject to the tax. Yet this goes only part of the way. If a manufacturer raises his prices to compensate for the tax, and his goods pass through several hands before reaching the consumer, the markups taken along the line will mean the ultimate consumer will pay an advance of considerably more than 2¼ per cent of the manufacturers' selling price.

Suppose manufacturers generally agree to bill the tax as a separate item? How long do you suppose it would remain a separate item, unchanged in amount, disclosing to the retailer, for instance, the exact amount the jobber paid the manufacturer for a bill of goods? There is only one answer to this question.

Any conceivable method of handling a "manufacturers'" sales tax would appear to lead inevitably to confusion, hard feelings between manufacturers and their customers, a bitterly fought struggle between them as to who should pay the tax, and an increase in retail prices to the consumer much greater than 2¼ per cent of the manufacturer's price.

Assuming imposition of a sales tax at this time to be desirable procedure, which is at least debatable, it would appear to be advisable for Congress to make it a tax of a small percentage on retail sales, to be collected by the retailer. Any administrative disadvantages inherent in such a method seem to be outweighed by the advantages. Manufacturers, in our opinion, should urge this policy on the Congress, for their own good and for the good of the country.

ANNUAL MEETING OF S. O. C. M. A.

Francis P. Garvan, Principal Speaker

The Annual Meeting of the Synthetic Organic Chemical Manufacturers Association of the U. S., Inc., was held at the Chemists Club, New York, Thursday, December 15th, 1932. A luncheon was served to members and their guests following which the President, August Merz, introduced Francis P. Garvan, President of the Chemical Foundation, Inc. and President of the U. S. Institute for Textile Research, who spoke most enthusiastically of the accomplishments of the American chemical industry since 1914.

Mr. Garvan said that the efforts of the manufacturing chemical industry begun fourteen years ago had transformed America from a dependent to an independent nation. He sighted numerous illustrations in the fields of pharmaceuticals, dyes, fertilizers, and products essential to the manufacturer of munitions where, prior to the outbreak of the World War, America was dependent upon foreign supplies but where today she is self-contained. Mr. Garvan gave it as his conviction that the demonstration of the value of the chemical industry to the American people had been so convincing and that the confidence placed in the industry by the government had been so thoroughly justified that, no matter what political party might be in power, the industry need never fear that the tariff protection necessary to its existence would be withdrawn.

Mr. Garvan expressed himself as thoroughly satisfied with the accomplishments and the strength of American industry not only in the chemical field but in other lines as well. The one great blot on the American Commonwealth as he sees it today is the industrial and international banking system. "The banker," he said, "is the only stumbling block in the path of American progress." He expressed his inability to comprehend why sixteen billions of dollars accumulated as the fruit of American brains and industry and representing in large part the hard earned savings of individuals, should have been loaned to foreign governments and industrial corporations.

"The bankers" he said "are traitors to America; syphons through which American funds are drained to foreigners." So long as foreigners are able to charge losses sustained anywhere in the world to loans secured from America, Mr. Garvan feels that American industry is laboring under an intolerable load. America must fight this condition, he said, and it can fight it successfully only if our American depositors, whether individual or corporate, will insist that no banking institution with which they do business shall loan any part of its deposits either directly or indirectly to foreigners.

According to Mr. Garvan American international bankers claim that they are merchants and that they must offer their wares in the best market. This, he says, is not a proper statement of the case, the bankers are really trustees for America and by loaning American funds to our international and industrial competitors they violate this trust.

Mr. Garvan said that the work of the Chemical Foundation was nearing its end and that a few more years at most would see it pass out of existence. There is one piece of work remaining, however, in the promotion of which he hoped the foundation could be helpful. This task is the furtherance of higher education in the basic science of arithmetic throughout the high schools and colleges of the country.

According to Mr. Garvan the neglect of this basic science is responsible for the lack of clear thinking on the part of most Americans. He claims that a full understanding of the principles of arithmetic whereby an individual might be able to set up for himself a true mathematical picture of the possible profits or losses accruing to him as an individual because of various governmental and social activities would be one of the greatest possible aids in furthering the economic life of the individual and the community.

According to Mr. Garvan the strength of America lies in its almost universal education. For the first time in history a great nation is nearly 100% literate and its percentage of those enjoying the benefits of higher education is far beyond that of any other nation in the world. There are today in America five times as many individuals who are college graduates as in the United Kingdom, Germany and France combined, despite the fact that their combined population is far greater than ours. This universal education of America, said Mr. Garvan, defies the spread of Bolshevism in this country and effectively frees us from the many other social evils by which less erudite nations are plagued.

Following Mr. Garvan's speech, the annual business meeting of the Association was held at which the following officers were elected for the coming year: President, August Merz, Calco Chemical Company; first Vice-President, E. H. Kilheffer, E. I. du Pont de Nemours & Co.; Second Vice-President, F. G. Zinsser, Zinsser & Co.; Treasurer, Ralph E. Dorland, Dow Chemical Co.; and Secretary, Charles A. Mace. There were also elected four members of the Board of Governors, as follows: E. A. Barnett, John Campbell & Co.; G. Lee Camp; Monsanto Chemical Works; A. L. VanAmeringen, VanAmerigen & Haebler and Ralph E. Dorland.

Glyco Sales Representative

Carl F. Miller & Co., of 1008 Western Ave., Seattle, Washington, has been appointed sales representative in the northwestern field by the Glyco Products Co., Inc., of Bush Terminal, Brooklyn, N. Y.

Carl F. Miller & Co. will specialize on special emulsifying agents and synthetic resins and waxes.

Farewell, 1932 Hail, 1933

1932 unquestionably witnessed the lowest ebb of human affairs experienced in a generation—industrially, socially, politically, psychologically —A good year to leave behind!

Those who adhere to the doctrine of recurrent cycles of depression and exaltation as affecting all things must be convinced, as we are, that the pendulum has already swung past its nadir and begun its upward course.

This thought should bring cheer to all as we enter the New Year—The forces of nature are on the side of progress—They can be aided and accelerated by intelligent effort. If we all apply ourselves diligently to the appointed tasks, firmly confident in our ability to speed recovery, there is little doubt that another twelve months will witness vast improvement in conditions affecting ourselves and all the world.

To this end we pledge the best efforts of the Howes Group of Publications—through all the agencies at our command we shall strive to be more helpful to the industries we serve, thus contributing our bit toward making 1933 a Happy New Year.

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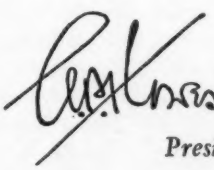


President.

Technical Notes from Foreign Sources

Acetyl-Cellulose; Determination of Quality by Fractional Precipitation

Fritz Ohl—Kunst-Seide 14, 3 (1932).—Work has been done, in recent years, upon the separation, into fractions of different physical and chemical characteristics, of various lots of cellulose acetate, tending to prove that commercial cellulose acetate is a mixture of different compounds which closely resembles each other chemically and physically, but which are, none-the-less, different substances; so that what is commercially regarded as cellulose acetate is really a group-product, not chemically homogeneous. Such work has been carried out from the purely scientific viewpoint without much, if any, regard to the importance of the matter from the technical side. Merely analytical figures, however exact, do not give any particular information as to the value of the product for a definite purpose. Yet it is clear that uniformity in constitution and properties of a given lot of cellulose acetate is essential to the uniformity of yarn and weave produced from it. Up to the present, the method of examination of cellulose acetate by fractionally precipitating it from solution, and examining the properties of the various fractions, is the most promising; and it seems strange that up to now no work, according to this method, has been carried out with reference to the technical valuation of the substance. This is the purpose of the present paper.

The author has carried out a considerable series of fractional precipitations of commercial lots of cellulose acetate, and has attempted to correlate the results of examination of the fractions with the properties of the fiber produced from the same materials. In order to make easier an accurate comparison of results, the lots of commercial acetate (from different manufacturers) were so chosen as to exhibit approximately the same general, gross constants. The products used were not only prepared by different firms, and so under doubtlessly different conditions, but were also prepared by employment of different catalysts, sulphuryl chloride and sulphuric acid. Of the samples studied, three involved the use of sulphuryl chloride, two of sulphuric acid, and one of zinc chloride.

Of six samples, the analytical figures show values, for acetic acid, of percentages from 54.02 to 53.78, of sulphuric acid, from 0.04 to 0.12, and viscosity figures of from 200 (210 in the second case) to 180 (the fifth case); the viscosity being measured by the ball-drop method in 20% acetone solution, at 20°C. (the figures given being the no. of seconds of fall). Except for the sulphuric acid values, these figures do not show much of anything. As the viscosity of cellulose acetate solutions varies, with increasing concentration, according to the degree of acetylation, another series of determinations of viscosity was carried out, this time in solutions of 1%, 3%, 5%, and 10%, the results being given in the second table.

The different lots (portions of them) were then saponified under standard uniform conditions, and the copper number determined for each lot.

For the fractional precipitations, samples were finely ground, and dried at 75° to exactly 5% moisture content. The samples were then dissolved in pure acetone to 5% solutions, all under exactly the same conditions, and the solutions stored in a dark, cool place, carefully sealed, until used (which was without unnecessary delay). Each of these solutions was then precipitated into three fractions successively, by addition of a mixture of distilled water and pure alcohol of 8/2; work carried out at 20°C., all conditions, as quantities, time-factors, stirring conditions, filtration and temperature-conditions, etc., being maintained uniform. The exact conditions are not stated, only the fact that they were uniformly maintained in each case. The results of examination of each of the three fractions from each of the six samples are given in a table. In general, it is evident from the results that the first fractions contain noticeable amounts of orgaric and inorganic impurities, that the second fractions consist of very pure cellulose acetate, which to a certain extent even precipitates in a crystalline condition, and that the third fractions are without exception of a lower viscosity than the others. By dissolving each fraction in pure acetone, each first fraction gave clear but yellowish-brownish solutions, the second gave almost colorless to slightly colored, but easily clouding solutions, while the third gave more cloudy and rather colored solutions. Each of the fractions, by dissolving in acetone and reprecipitating as before, could be split up into subfractions of higher and lower viscosities.

Three other lots, of lower total viscosity, were obtained from three of the manufacturers; and these lots tested in the same way as before.

From each of the main lots, nine in all, fibers were spun and films produced, from 2/8 alcohol-acetone, and the fibers and films tested for tensile strength and elasticity.

During the course of two years, other lots, from the same firms, and with the same specifications and gross values, were obtained and tested as before. These lots all differed from each other, and from the first lots, though presumably produced under the same conditions.

The author summarizes the results of his studies as follows:

1.—Commercial lots of cellulose acetate are non-uniform in composition, and can be separated into several

fractions, which differ from each other chemically and physically.

2.—The ordinary analytical data given for a cellulose acetate give no criteria for the uniformity and practical quality of the product.

3.—Different cellulose acetates, with practically the same acetic acid content and viscosity, when fractionally precipitated under exactly the same conditions, give fractions more or less broadly distinguishable from each other.

4.—Differences in the fractions can be determined even in case of products of the same specifications, from the same maker.

5.—The relative quantity of the individual fractions is dependent upon the nature of the cellulose used for acetylation, and upon the course of the process employed (the kind of catalyst used appears to be of importance). Sulphuryl chloride appears to have a more favorable action than does sulphuric acid.

6.—The quality of the cellulose acetate appears to be higher, the more uniformly the separate fractions precipitate in a given time-interval.

7.—The quality of the cellulose acetate is higher, the smaller the amount of the third or the final fraction, and the more the properties of the first fraction approximate those of the original cellulose acetate.

8.—The highest tensile strength of the spun or flowed product is afforded by a cellulose acetate fulfilling the 6th and 7th conditions.

9.—The highest elasticity of the spun or flowed product appears to be afforded by a cellulose acetate in which the first and last fractions are the largest in quantity.

Dyeing of Mixed Weaves of Cotton and Artificial Silk

G. H.-Deutscher Faerber-Ztg. 67, 305 (1932).—To dye cotton or artificial silk (viscose), the same dyestuffs are suitable, and naturally so, viscose being only regenerated cellulose. This fact would, a priori, prevent any difficulties in dyeing mixed weaves of the two fibers, cotton and viscose, were it not for a distinctive difference in affinity of the two dyestuff fibers for the dyestuff. Natural cotton possesses the maximum affinity for a dyestuff at a lower temperature, while viscose shows its maximum affinity at a higher range of temperature. Accordingly, a mixed weave of the two fibers has to be dyed (if the dyeing is to show no difference in shade between the two components, which is sometimes the case) over a range which takes these characteristics into account; dyeing must begin at a low temperature for the cotton, and the temperature gradually raised to the boil, in order to force the dyestuff upon the viscose as well. Simple as the principle is, there are some points which have to be regarded duly, in order to obtain level dyeings.

One of the principal sources of difficulty in attaining level dyeings as to the entire weave lies in the presence, in the cotton, of raw cotton's natural impurities, of a waxlike sature, and incompletely removed; and, in the artificial silk, of different substances of oily nature, originating in the spinning, twisting, or weaving processes; temporary finishing agents, if the term may be used, which have possibly not been removed at all, rather than only partially removed; the goods may be in the unclean condition just as they come from the loom. A perfect wetting out and cleansing must certainly take place before the goods enter the dyebath; as obvious as this would seem, the point needs constantly to be emphasized. The goods should be treated for 20 minutes in a boiling bath of a suitable cleansing agent; and this cleansing agent should be one of the several now on the market, of which comparatively little is needed. This property, of working at a comparatively low concentration, is so valuable that it ought to outweigh any slight difference in cost. Such products are generally sulphonated oils plus a fat-solvent, and simultaneously accomplish complete wetting-out and cleansing. The modern preparations are stable when used with hard water. Soda should not be employed at all as an assistant when hard water is being used, since the calcium or magnesium is precipitated on the fiber as carbonate, with the familiar consequence of incrusted, brittle fibers, and frequent streaky dyeings. Such a deposit could be removed only by a separate bath of dilute hydrochloric acid, and subsequent washing, involving expense and extra trouble and delay.

After rinsing, the dyeing takes place, except in case of bright or delicate shades, which might involve previous bleaching. But, even when bleaching is not really necessary for this reason, it is often carried out before dyeing, since it is becoming generally realized that viscose silk, which sometimes dyes unevenly because of some details of manufacture, will always dye level if subjected to a light bleach first. Pre-bleaching is therefore being carried out more and more, merely as a step toward making level dyeing absolutely certain.

The dyebath is brought to 25°-30°C. at the highest, a little soap or dyeing oil added, the goods treated in this bath for a short time, the dyestuff solution then added little by little while the goods are being worked steadily, and then, after about 15 minutes at this temperature, steam is passed in, the bath gradually raised to the boil, and kept at that temperature for at least 15 minutes. The dyestuff employed has to be carefully selected, on account of the tendency of viscose to dye unevenly (note what has been said as to the effect of pre-bleaching). A dyestuff which levels well must be chosen, but also one which dyes properly with the cotton component of the weave. Blues cause most difficulty, but some of the mode colors do not stand far behind in this particular. Some of the best dyestuffs are Chrysophenine G, Chlorantine Light Orange G, Congo Orange R, Erica BN, Chloramine Red 8BS, Benzo Fast Scarlet (all brands) Dianil Blue G, Diamine Blue 3B, Diamine Black BH, Chlorantine Light Violet 5BL, Brilliant Benzo Fast Violet BL and 2RL, Benzo Green FF, Brilliant Benzo Green B, Diamine Bronze Brown BE, Diamine Catechin G, Naphthamine Brown D5G, Chlorantine Light Brown BRL, Benzo Fast Black, L. All of these dye level, and permit shading at the boil.

Artificial Silk Weighting

K. Swoboda—Kunst-Seide 13, 300 (1931).—The title of this paper "Increasing of Weight and Improvement of Covering Power of Artificial Silks through Weighting"—is somewhat more suggestive of the purport of the article.

It seems natural that weighting should have been attempted upon artificial silks. The practice has long been common for natural silk, which is a very fine, lustrous fiber; the synthetic fibers are also very fine and lustrous, from which fact the group-name of "artificial silk" has been given to them; therefore, one would reason, weighting of them in much the same way as with natural silk ought to be possible, and the advantages gained with the natural fiber ought to be expected with the synthetic ones. While, as at first, mostly only fine filaments were produced from viscose, weighting was expected to add, not only to the weight, of course, but to the covering power of the fiber in weaves, exactly as with the natural fiber; and this reasoning still holds good, in spite of recent success in spinning coarser and looser yarns.

Considering the great technical importance and degree of development which has been attained by the weighting process as applied to natural silk, it would be supposed at first that the carefully worked-out methods suitable for the natural fiber would be equally applicable to the synthetic. But this is true only as touching the factor of gain in weight, which point leaves nothing to be desired—if the gain in weight alone is to be considered, the customary tin phosphate-silicate weighting gives results even better with the artificial fiber than with the natural—it is not true in regard to the safety, so to speak, of the fiber, since it seems trite even to mention the great sensitiveness of artificial silk toward mechanical handling while in the wet condition. The tedious handling of artificial silk in the wet condition, necessary if the treatment is to follow that customary for the natural silk, will, even with the most careful working, lead to serious damage to the material, which will make itself powerfully evident on subsequent working up of the yarn. Accordingly, the methods suitable for natural silk must be suitably modified to meet this sensitiveness of the artificial fiber. Above all, the treatment with waterglass, so suitable for natural silk, must be avoided, so that we can use only the precipitation of tin phosphate as our method. But, by this means alone, a weighting of 50% can be attained, without the physical properties of the fiber being so altered as to cause trouble in the working up.

The method of working is as follows: the skeins of artificial silk are immersed for ½ to 1 hour in a stannic chloride bath of 25°B., with a basicity number of +9.2 Cl: this basicity number is as important as it is in the case of natural silk. Too high a content of free HCl diminishes the increase of weight attainable, while a tin chloride bath which is too basic in reaction does give, to be sure, a very good increase in weight of the fiber, but is likely under some conditions to produce this weighting by mere excessive deposition of stannic hydroxide loosely adherent, which subsequently will brush or rub off.—After treatment in the tin chloride bath, the goods are freed from excess of the tin liquor in a centrifuge whose basket is coated with hard rubber, and then washed as thoroughly as possible in a skein washer, with cold, running water, until the washings are free from acid. The fixing is carried out by means of the usual sodium phosphate treatment, the bath being made up to 6°B., and treated with sodium carbonate until an alkaline reaction is obtained upon phenolphthalein paper. The goods are treated in this bath for one hour at 50°C., then centrifuged, and rinsed, first warm, then cold. According to the degree of weighting desired, the above treatment may be repeated once or twice. If it is to be repeated, the goods, after coming from the phosphate bath, are rinsed in an acid bath containing 1-2 g. of hydrochloric acid per liter, well centrifuged, and again treated as before in the tin chloride and sodium phosphate baths. After the final phosphate bath, if the goods are treated in a fatty soapbath or with one of the oils appropriate for ordinary artificial silks, the fiber will be soft and flexible, and better suited for the mechanical working up to follow.

With artificial silks of 120-150 deniers titre, a single weighting adds about 12-18% to the weight of the fiber; a second treatment increases the gain to about 28 to 30%. A third treatment makes it possible to raise the gain in weight to 50% and over. There seems to be no essential difference in capability of increase in weight, between cupro and viscose-silk. The artificial silk, when it has been properly weighted, possesses a dull, soft luster, similar to that of natural silk; its scroop is good and soft, and it displays an excellent affinity for the dyestuffs customary for weighted natural silk. Any difficulties in dyeing and levelling do not in general appear, if the goods have been properly treated. With a heavy weighting, a distinct decrease in tensile strength takes place, though it is serious only with a heavy weighting—some decrease, of course, may be noticed even with a single weighting, but it is there of little practical significance.

Beside the stannic phosphate method, the barium sulphate method of weighting is also used, but the gain in weight is low, only about 5-6%, and the method is employed more for producing a matted luster than for actual weighting. The goods, generally in skein-form, are wetted out in a bath containing 3-5 g. of sulphuric acid per liter, lukewarm, then centrifuged, and without rinsing placed in a bath containing 5 g. of barium chloride per liter, at 60°C., and left there for ¼ to ½ hour. The goods are then well rinsed, and treated in a bath containing a fatty soap and finishing oil. The barium sulphate precipitated in the fiber somewhat obscures the luster of the fiber (not entirely; the effect is that of reduction of the undesirable excessive luster), and does not interfere at all with subsequent dyeing, at least, when Glauber salt is not used. The barium sulphate to some extent also

takes up some of the dyestuff, as well as the fiber—especially if certain dyestuffs are used; and the results are excellent for yarns and stockings. If the barium sulphate treatment is properly carried out, the fiber is not weakened to any undesirable extent (only from 100% to 98-99%; the figures for stannic phosphate, as to tensile strength, are, for untreated, 1st, 2nd, and 3rd weighting, 100%, 98%, 92%, and 81%, for average cases).

In all cases, however, the final treatment with fatty soap and finishing oil is important.

Causes of Some Failures in Dyeing

R. Schmidt—Deutscher Faerber-Ztg., 68, 232 (1932).—Simple as is the principle of mordanting cotton, its practical carrying out is not easy. Were the goods of absolutely equal conditions and quality throughout, the matter would be simpler; but, though we are dealing, in the case of cotton, with a fiber as homogeneous as any fiber can possibly be, inequalities do exist, and produce like inequalities in the dyeing. The process of mordanting, as usually carried out, consists, of course, in treating the cotton with a tannin solution of 2-10%, depending upon the depth of dyeing desired, and then fixing the tannin upon the fiber by treatment in a second bath of tartar emetic or some similarly acting antimony salt. Now, when the cotton, after kiering, is allowed to lie about in the wet condition, unequal drying or only partial and unequal drying takes place, and the condition of the goods will vary, according to the degree and rate of drying in each part of the lot of goods (this is also true of leaving the goods lying about in the wet condition after mordanting.) After kiering, the goods ought to be soured off in a lukewarm bath containing 1 to 1½ liters of hydrochloric acid per 400 liters of water. Water containing iron should, of course, be avoided.

The addition of formic or acetic acid to the tannin bath gives clearer tones on dyeing, and also favors a good, uniform penetration of the dyestuff. Alum may also be used for the same purpose, 1-2% being added to the tannin bath; or the goods, between mordanting and dyeing, may be treated in an alum bath. Baths too strong in dyestuff should be avoided, as in such cases the dyestuff is absorbed too rapidly, and becomes more concentrated upon the surface of the goods, and the color rubs off badly after the goods are dried.

If direct dyestuffs are used, standing baths should not be used too far; they work best when used a comparatively few times, even though still containing reasonable amounts of dyestuff. With these dyestuffs, addition of soap to the bath favors level dyeings; but the soap should be added only after the soda, which is also generally used, has been added, and the bath has been brought to the boil.

In developed dyeings, there is a considerable number of possible causes of uneven dyeing: incomplete diazotization, omission of a mild souring after diazotization, use of too little of the developer, too acid a condition of the goods when passed into the developer, etc. When dyeing with the Naphthol AS series, especially, the goods must be well cleansed in order to be sure of proper impregnation. Yarn is generally padded in a 20/1 bath at 30° for 15-20 minutes, the excess of liquor being removed by centrifuging. It is rather important to line the basket of the centrifuge with a cotton cloth impregnated with the padding solution, and to pack the yarn in carefully. The amount of free alkali in the padding bath is an important factor, and should be controlled according to the requirement of the particular AS brand being used. In the development in the diazotized bath, the bath must be kept carefully cold, and the duration of development should not exceed 20 minutes. The after-treatment consists of washing, first with cold, then with hot, water, soaping at 60° with 4-5 g. of Marseilles soap per liter, washing again with cold and with hot water, and finally brightening with a formic or acetic acid bath. Efficient centrifuging after the padding, and good soaping after the development, have a great influence upon the fastness of the dyeings to rubbing.

Finishing of Artificial Silk

"H."—Kunst-Seide, 13, 329 (1931).—Soft and flexible as artificial silk is, its working up into knitted or woven goods is still more satisfactory and simple, when it has been finished—lubricated—suitably. The more delicate sorts of fabrics have been in favor until recently; now that the thicker weaves are coming more into demand, a thicker or less twisted yarn is being used, for the sake of greater fullness and covering power, which such yarn naturally imparts to the weave; and these thicker, softer yarns likewise gain greatly by proper finishing. The finish has, of course, frequently to be removed after weaving or knitting, before dyeing or printing of the fabric can take place. As artificial silks are generally furnished by the producers in skein form, the spooling of them requires in a special way flexibility and smoothness of fiber. This is especially the case in dealing with the thicker, less firmly twisted, "fuzzy" yarns, which, unless the surface be rendered smooth and almost slippery, would afford continuous opportunity for the catching and snapping of individual filaments in the yarn, not only weakening the yarn, but giving rise to disagreeable projecting fuzz.

As to the necessary materials used for this finishing or lubrication of the yarn, various substances have been tried out. Glycerol and gelatine preparations, for example, were among the first to be used. They could be employed for the final finish for colored goods, being transparent and colorless. With gelatine preparations, however, a certain degree of brittleness was imparted to the yarn, which made the weaving into certain types of fabric unsatisfactory. Soap preparations have also been tried out, both pure and with certain additions, such as olive oil; vegetable glue preparations have been tested also. None of these substances have proved satisfactory. The Schetty method employs linseed oil dissolved in some volatile organic medium. By evaporation of this solvent, the lin-

seed oil is left as a thin layer upon the fiber (inside as well as outside, of course, as is necessary for the gaining of perfect flexibility). This is satisfactory for the finer or more strongly twisted yarns, but does not give such good results with the less strongly twisted, fuller, plumper yarns. In any case, the linseed oil finishes cause difficulty by too extensive hardening of the oil through oxidation, if the goods are stored for more than a few days; the finish cannot be removed by soap satisfactorily, only when quite fresh. And, if not perfectly removed, great trouble is encountered in the dyeing; the goods dye spottily or streakily.

More recently, emulsions of oils have been used. These are satisfactory in some points; they maintain a certain fairly uniform degree of humidity in the fiber somewhere between too little and too much, and so to some extent prevent the moisture content from varying too largely according to the fluctuations of the humidity in the working rooms. Among other preparations, emulsions of olive oil in soda have been used.

Most recently, however, attention has been turned from the use of fluid oil preparations, and such semi-fluid materials as cocoanut butter, to the hard fats. Modern artificial silks are soft enough already; what is needed in a finish is rather an actual lubrication of the surface, in order that the yarn may slip smoothly over the surface of anything which it may encounter—other strands of yarn, platens, needles, etc., encountered in the weaving or knitting—without any particular resistance being met with. Of the harder fats, etc., paraffine was, of course, tried out first. Its main disadvantage was its non-saponifiable property: in addition, paraffin does not add to the suppleness of the yarn. The waxy alcohols are the most recently studied substances, and they appear to be exactly what has been desired. One of the commercial preparations based upon them, Avivierpaste RB99 (R. Bernheim, Augsburg-Pfersee) is a good example of these most modern products. It is stable toward lime and acid, and is used in a ratio, for a standing bath, of 200-700 g. per 1000 liters, a much lower concentration than is possible with any other oil-preparations.

Legal Requirements for Coloring-Matters for Foodstuffs, etc.

Dr. A. Beythien—Farben-Chemiker 3, 47 (1932)—A discussion of the new German "Pure Food Law." It would appear that the requirements of this law are more strict and farther-reaching than is the case in this country.

The German law, as treated in this discussion, is divided into two logical sections; first, as to actual foods and drinks ("all substances which are designed to be eaten or drunk in the unchanged, prepared or worked-up condition"), and, second, as to anything whatever which may be involved in the preparation, etc., of such substances, or anything which is designed for a use which will bring it into relation with the life-process. The sections of the second subdivision involve

1—implements for carrying on eating, drinking, cooking, etc. (the phase seems an awkward one, but the reason for it will be seen further on), or implements or apparatus which are designed for the obtaining, production, working up, measuring out, weighing out, packing, preserving, forwarding, or use of such materials, under condition that such matters at any time come into direct contact with the food-material, etc.

2—agents for cleansing, treating, coloring, or beautifying the skin, hair, nails, or mouth.

3—articles of wear, decorative articles, carpets, masks, candles, artificial plants, or parts thereof.

4—petroleum.

5—dyestuffs or coloring matters, insofar as they do not pertain to actual foods or drinks.

6—other articles which may be specified by the authorities, after consultation with the producers.

Provision is made for inspection, by the police or other constituted authorities, of the processes, etc., during their carrying out, under due precaution that such inspection shall not interfere with the work going on at the time.

The new law is more strict than its predecessor, for, according to the former law, prosecution for violation was possible only when foods or beverages had actually become prejudicial to health through addition of coloring-matters; whereas the new regulations absolutely forbid the production, sale, use, or handling in any way, of coloring-matters which are dangerous to health (this is not to be understood to mean that such coloring-matters cannot be produced for purposes which do not involve physical relations to life). As to the use of such coloring-matters in foodstuffs or beverages, it was possible formerly to employ such substances in quantities below what would make the material harmful; now, the use of such colors is forbidden under any conditions.

The question as to what coloring-matters the new law applies cannot be answered exhaustively, or at least in detail. Producers might at least well adopt as fundamental the list of coloring-matters which are defintely designated, in the law of July 5, 1887, as prejudicial to health; in general, those which contain antimony, arsenic, barium, lead, cadmium, chromium, copper, mercury, uranium, zinc, tin, gamboge, corallin, or picric acid.

Testing for the presence of illegally-present coloring-matters is carried out upon 20 g. samples. Solid foodstuffs or materials are weighed out directly to this amount; if the material is in mass and colored superficially, 20 g. of the surface is shaved off; in the case of liquids (fluids, pastes, etc., such as beverages, fruit pastes, conserves, jams), so much is taken that the dry content of the sample amounts to 20 g. (in the case of colored carbonated beverages, this would be an appalling amount!)

The author states that there has been little trouble from illegal colorings for some time; that during the past thirty years no cases have been reported. The occasional com-

plaint that aluminum powder is employed for the decoration of chocolates and such materials seems to him to be without justification, for such a use of pure aluminium is allowed, while that of aluminum bronze, containing copper, is not. Even in this latter case, the law may later be modified, since copper is now believed to be much less prejudicial to health than was formerly supposed, and in the form of its compounds is tacitly allowed to be used, e.g., for the increasing of the green hue of pickles and such preserved material.

The mineral colors are seldom used in foods and beverages, doubtless because of their general insolubility; more interest exists in regard to organic dyestuffs; and, of course, the question in regard to these is still more difficult to answer. The law forbids the use of organic dyestuffs consisting of or derived from gamboge, corallin, or picric acid, although it is well known that there is a large number of artificial, and a considerable number of natural, coloring-matters, which are dangerous to health. The chemical literature mentions, for example, Martius Yellow, Methylene Blue, Phenylene Brown, Safranine, Aniline Gold, Golden Orange, Chrysophanic Acid, etc., as having proved definitely to be dangerous. The situation at present means that the harmful nature of a given coloring-matter must be pointed out (by the authorities?) to the colormaker or consumer (the purchaser of such colors for use in his products). The colors mentioned must of course be avoided, but this particularized avoidance is hardly sufficient, in view of our uncertainty regarding nearly all of the vast number of dyestuffs manufactured. Our point of view must unavoidably be that expressed thirty-five years ago by R. Kayser—"any dyestuff is to be considered suspicious in the physiological aspect, insofar as its harmless nature has not been demonstrated by experience or by convincing physiological tests."

This uncertainty may be partly cleared up by further enactment or modification or supplement of the present requirements, which will involve cooperation of the public health authorities with the manufacturers, dealers, consumers, and experts. The author considers that it would be well, instead of depending upon avoidance of coloring-matters specified as known to be harmful, to set forth a list of colors which are definitely known to be harmless, and accordingly favored for use; as has been done in several countries. E.g., according to the Swiss law of February 23, 1926, only the following colors are allowed:

a—of inorganic colors, only such as do not contain antimony, arsenic, barium, lead, cadmium, chromium, copper, mercury, uranium, zinc, or cyanides.

b—of natural coloring-matters, those derived from fruits and parts of such plants as are suitable for use as foods or condiments; saffron, annatto, alkanna, cochineal and cochineal red, sandalwood, orseille and its paste, chlorophyll, indigo (natural or artificial), liquorice, caramel, logwood or its extract, sumach or its extract.

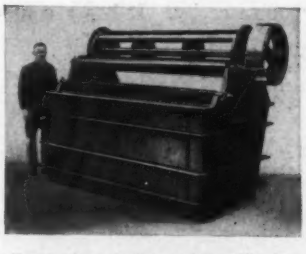
c—of synthetic dyestuffs, only Naphthol Yellow S, Acid Yellow R, Chrysoidine, Auramine, Sudan I and G, oil-soluble colors of the type of aniline-azo-dimethyl-aniline, Tropaeolin 000 No. 1, Tartrazine, Orange I. Fuchsine, Acid Fuchsine, Roccellin, Bordeaux and Ponceau Reds, New Coccin, Ponceau 3R, Amaranth, Erythrosine, Eosine (also the spirit-soluble form), Phloxine P, Aniline Blue, Water Blue, Alizarine Blue, Indigotine and Indigo Carmine, Induline, Methyl Violet B and 2B, Light Green SF, Malachite Green.

This is a list of considerable scope.

In addition, the German law forbids the use of any coloring-matter except "Zuckercouleur" (caramel?) for certain foodstuffs, as certain kinds of prepared meats and sausages, honey, roasted coffee; and for a list of others, as wine, beer, brandy, only caramel is allowed.

The coloring-matters designed for use with anything whatever, not of foodstuff nature, which is to come or may come into contact with the mouth or any part of the body which is capable of absorption (contact directly or indirectly), come under a second classification; and such a classification is of course extensive in limit. Among matters referred to are articles made of rubber, such as nipples for nursing-bottles, teething-rings for infants, protective rings for warts and corns, rubber tubing for siphoning wine, beer, or vinegar, drinking cups—all such things must particularly not contain colors involving the presence of lead or zinc or antimony (a new regulation in preparation will allow only rubber goods containing less than 1% of lead) (antimony, cadmium, and red mercuric sulphides are not forbidden, because of the great inertness of the compounds)—articles of wood, wax, etc., (mostly toys, artificial flowers, plants, Christmas trees)—articles of paper or cardboard, as children's picture-books, games, etc.,—cartons and such containers, carpets, hangings, masks, artificial fruits, writing materials of any sort (including typewritter ribbons), lamp and light shades, textile goods, any kind of cosmetics, candles—altogether, a comprehensive group of articles. In many of these cases, certain insoluble or non-volatile derivatives of poisonous metals are allowed.

Haveg—An Acid and Corrosion-Resistant material



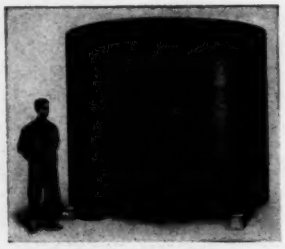
Haveg piece dyeing machine—6½ ft. wide

In wet processing, especially dyeing, one of the most trying problems of the Textile Industry has been to obtain a material for tanks and vats, and so forth, which would successfully resist acids and chemicals.

Such a material has found wide use in Europe, especially in Germany, where it was introduced about eight years ago, under the trade name of "Haveg."

This product, under the same trade name, will now be

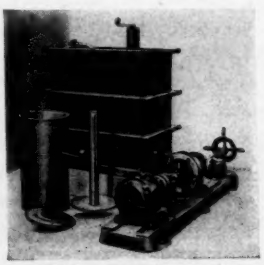
manufactured and marketed in this country, by the Haveg Corporation, of Newark, Delaware (affiliated with the Continental Diamond Fibre Company). The Newark Corporation has completed necessary arrangements with the holders of foreign and American patents, and are now erecting a new plant at Marshallton, Delaware. The new plant is scheduled to begin operation January 15th, 1933.



Single piece Haveg Tank, 4200 gallon capacity

Haveg is produced by using a selected asbestos base and combining it with a modified form of phenol-formaldehyde type of resin. This in turn is moulded into a compact mass, providing a material which is completely resistant throughout. There is no possibility of chemicals penetrating the material and destroying the base, as has been the case sometimes with products of this type in which non-acid-resisting cellulose materials have been used.

In the mould the mass is subjected to heat and pressure, and forced into a single solid piece of the shape and size desired. Up to the present Haveg tanks have been made as large as 10 ft. in diameter, and 10 ft. in height. By combining units of easily handled size almost any type or size of installation may be secured.



Haveg Package Dyeing Installation

Haveg is about one-fifth the weight of iron and one-half as heavy as aluminum. It has shown during the eight years that it has been successfully manufactured abroad, that it will withstand shocks and blows remarkably well, and does not chip or fracture easily. It has a compressive strength of 10,400 pounds per square inch.

Temperature changes apparently have little or no effect on the new materials; the regular grade can be used up to 130 deg. C., or 265 deg. F. Because of the fact that Haveg is absolutely non-absorbent, tanks, vats, kettles, and so forth can be flushed out with a hose and water.

Representative Haveg Corrosion-Resistant Piping

One interesting property claimed for Haveg is that due to the low co-efficient of heat conductivity, dye plants using Haveg equipment have saved from 20% to 50% of the steam required before Haveg equipment was installed.

In listing the acids to which Haveg is resistant, the Haveg Corporation includes:

Acetic, any conc.
Fatty acids.
Formic, up to 40%.
Hydrochloric, any conc. and tempt.
Hydrochromic, any conc.
Lactic, any conc.
Oxalic, any conc.
Phosphoric, any conc.
Sulphuric up to 50%.
Sulphurous.
Tannic.
Tartaric.

Eight bases are also listed, along with seven solvents and thirty-two salts and other chemicals. This last is further augmented by several other acids, and compounds, to which a special grade of Haveg known as "43," is resistant. The regular grade of Haveg is known as "41."

There are but eight chemicals to which Haveg is not resistant, according to the manufacturers.

H. W. Butterworth & Sons Co., manufacturers of textile finishing machinery with offices in Philadelphia, Pa., Providence, R. I., and Charlotte, N. C., have been appointed exclusive Haveg distributor in the textile industry.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

CLASSIFIED

EXPERIENCED SALESMAN - DEMONSTRATOR, Chicago Territory. Has thorough knowledge of all dyestuffs, imported as well as domestic, their application, and the use of all finishing materials, water softeners, penetrators, etc. Practical Dyehouse experience. References. Address Box No. 740, American Dyestuff Reporter, 440 Fourth Avenue, New York.

POSITION WANTED—Experienced salesman, demonstrator or dyer. Has thorough knowledge of domestic and imported dyestuffs and their application. Desires location in Southern or New England territory as salesman-demonstrator or dyer. Knows both Southern and New England trade. Can dye piece goods, raw stock, yarn and hosiery. Address Box No. 759, American Dyestuff Reporter, 440 Fourth Avenue, New York.

VANISHING